The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Vol. XXIV, No. 4 CHICAGO February 12, 1921

EDITORIAL DEPARTMENT—

Nathan C. Rockwood, Editor
Chas. A. Breskin, Assistant Editor
L. R. Croy, Assistant Editor

BUSINESS DEPARTMENT—

Geo. P. Miller, Manager.

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N. C. Rockwood, Vice-President.
Geo. P. Miller, Treasurer.
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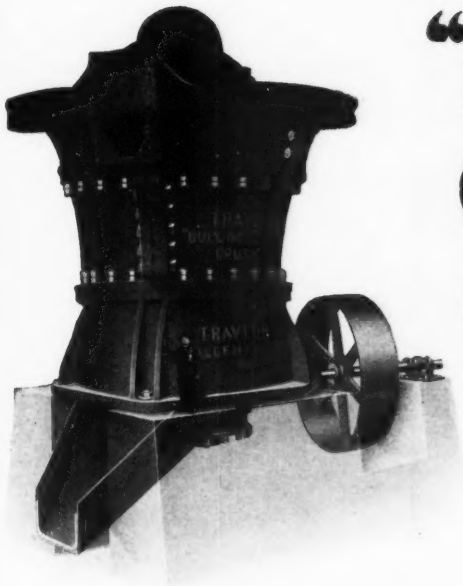

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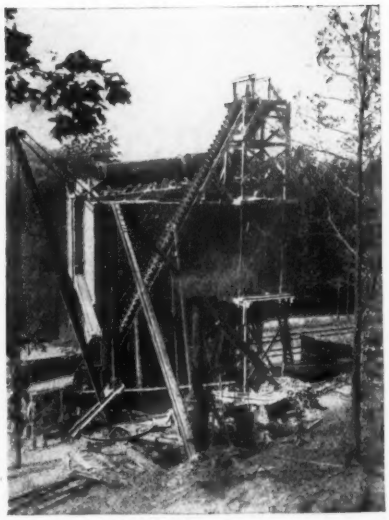

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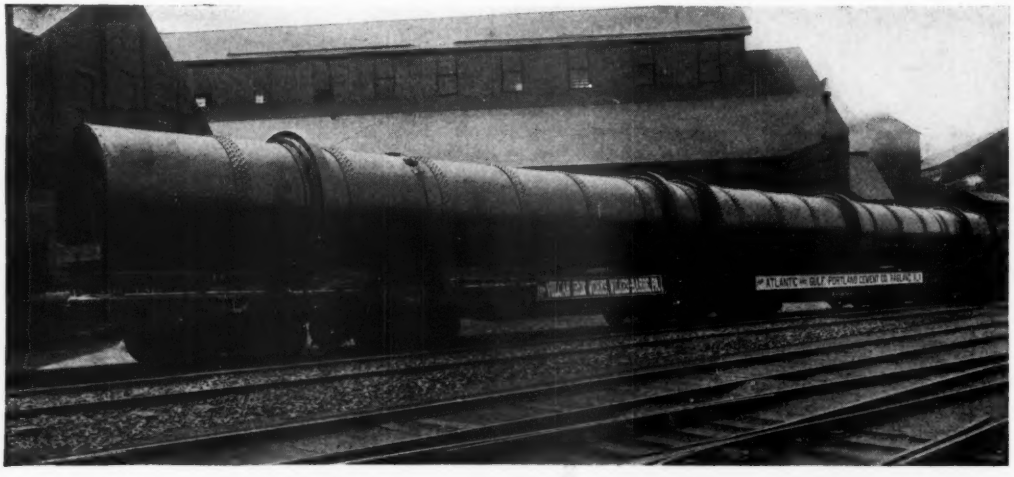

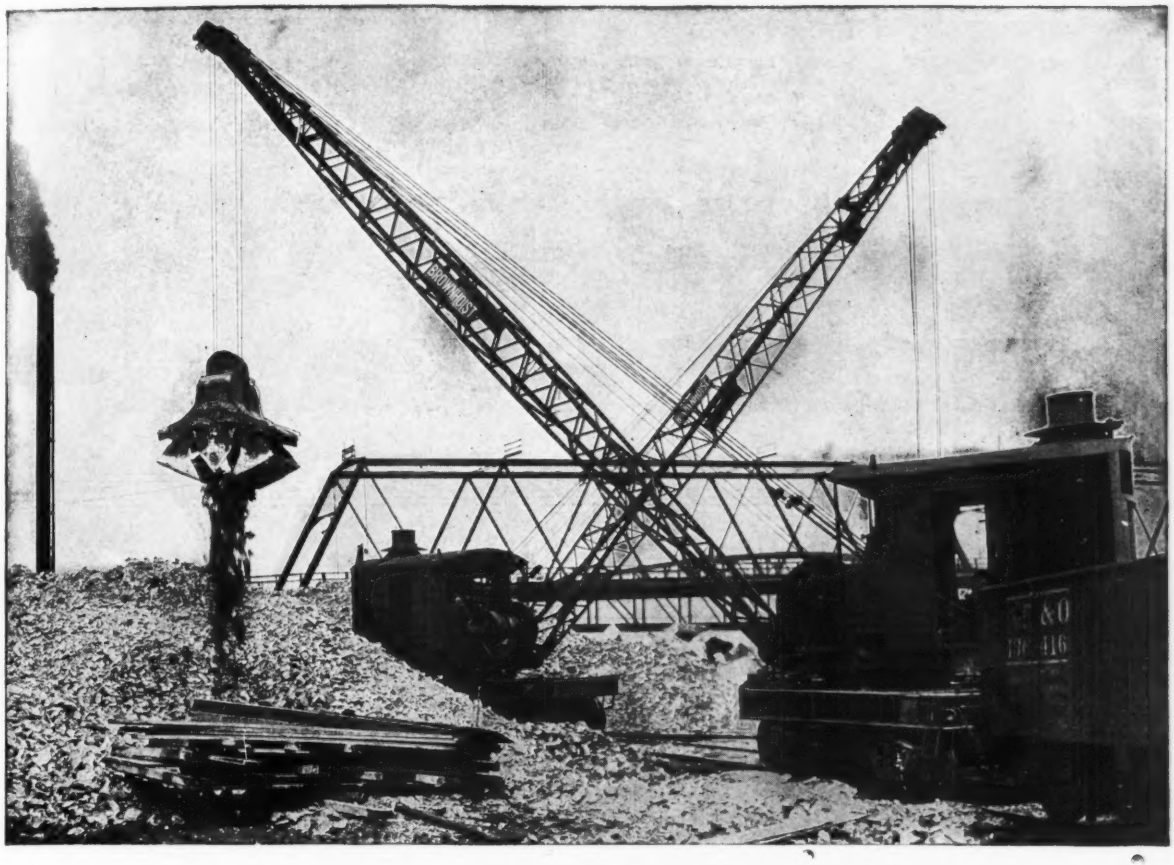

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Negotiations will close on March 1st, 1921.

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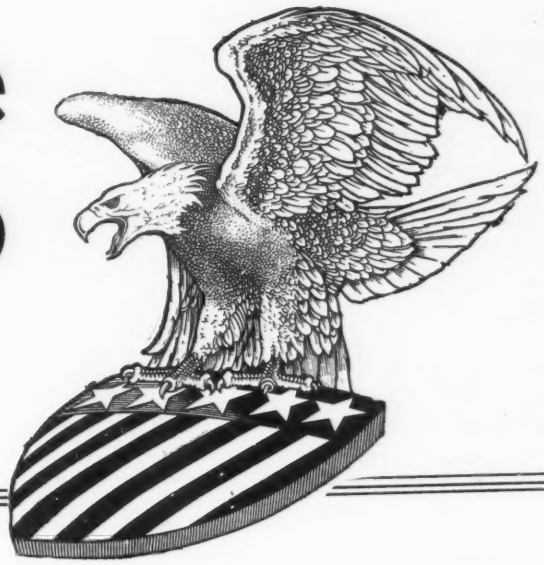

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CELLULOSE AND CORDITE

To be Sold by Negotiation

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Diphenilamine 5%.
Balance—Nitro Cellulose—Nitrogen contents of same 12.60%.

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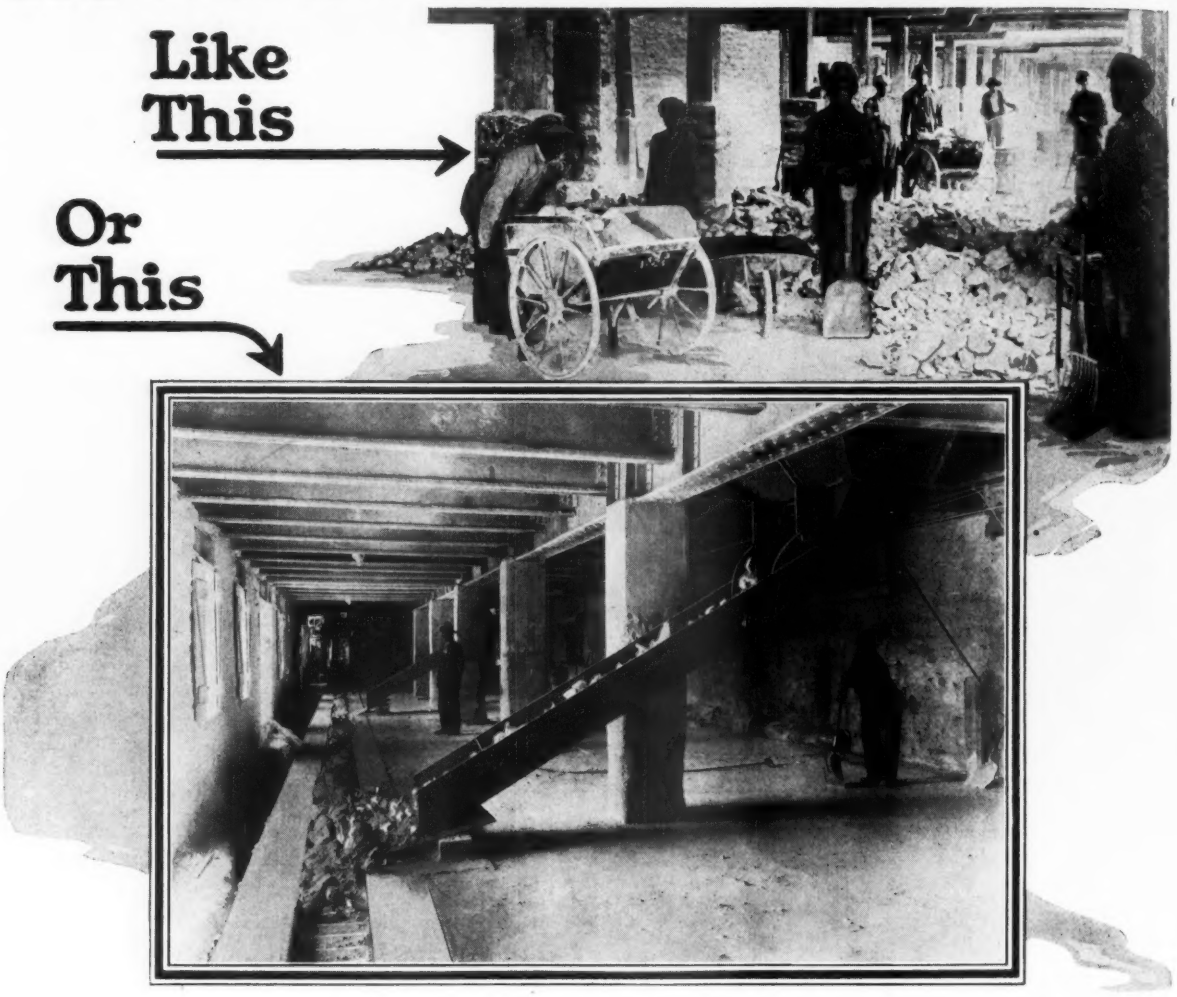

ABOVE—the old-fashioned system of drawing the kilns by hand piling the lime on the floor, and carting to crushers or cars in wheelbarrows.

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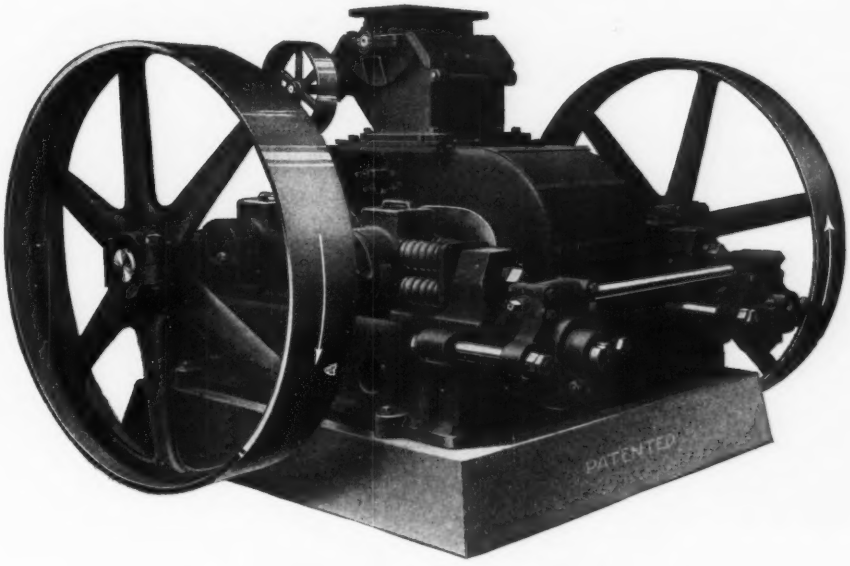

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Strong, Massive Machines, Built to Withstand Hardest Usage, Such as Crushing Hardest Ores, Emery, Alundum, Corundum, and Other Hard Materials

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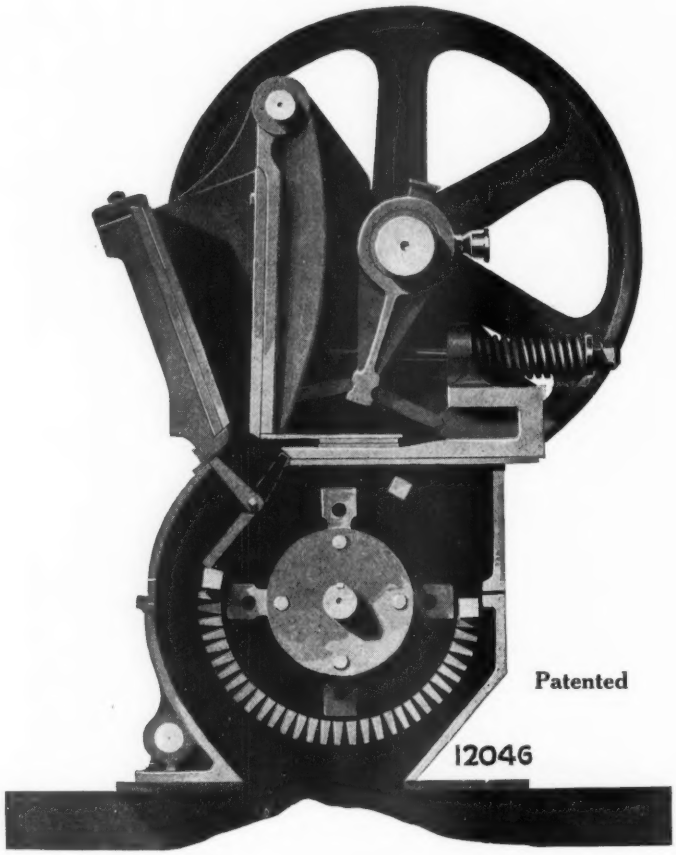

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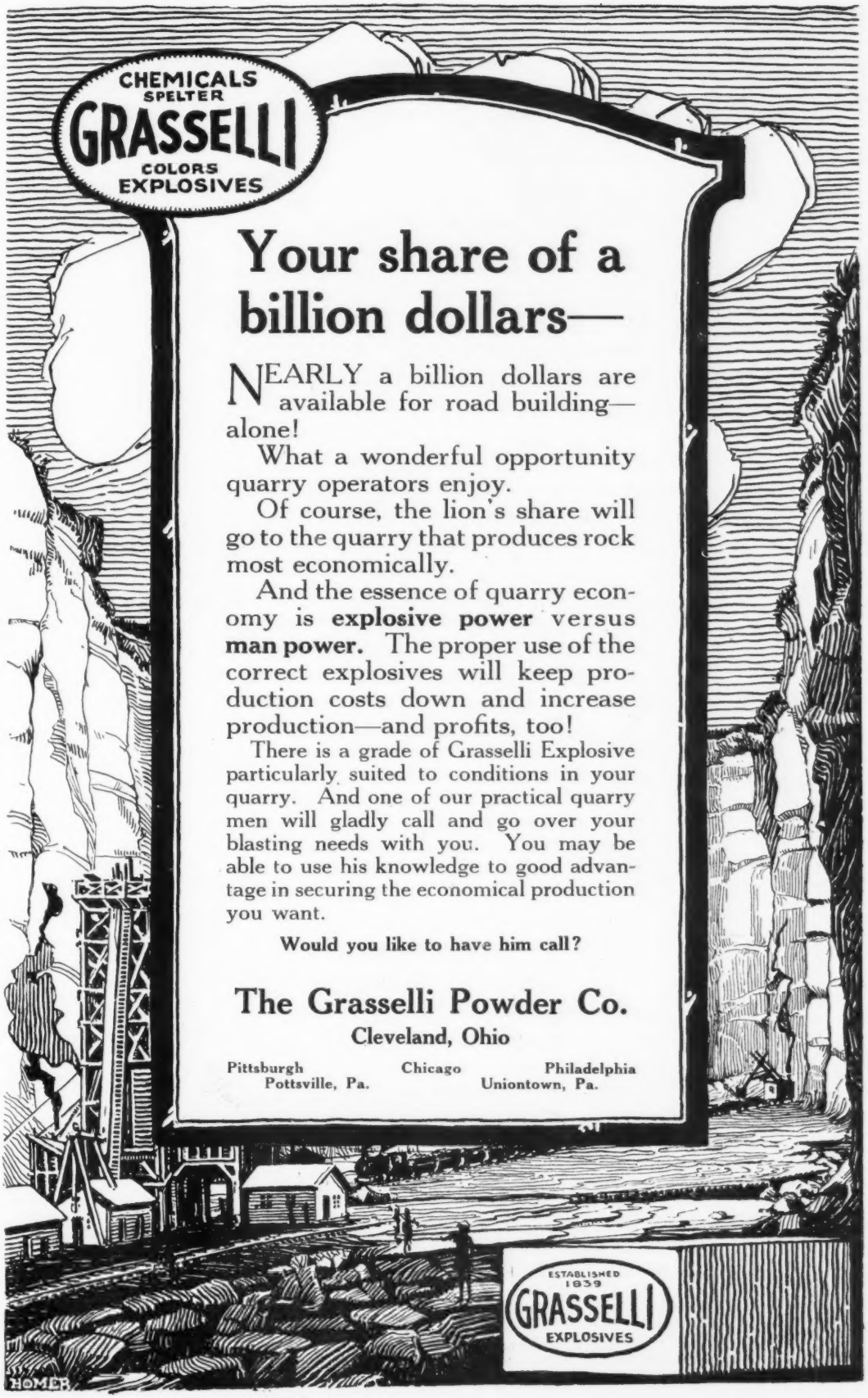
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NEARLY a billion dollars are available for road building—alone!
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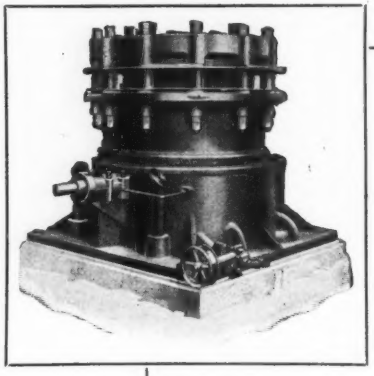
ROCK CRUSHERS

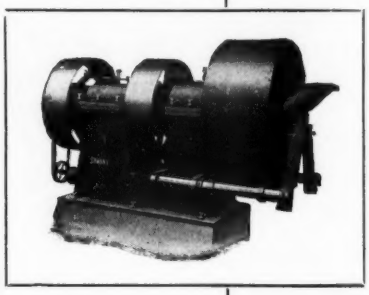


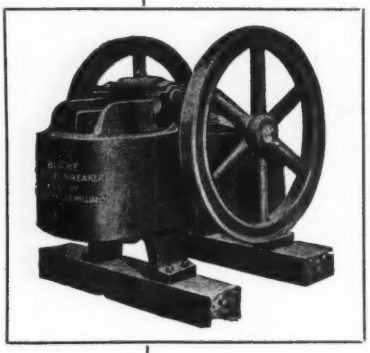
Symons Vertical Disc Crusher

A large capacity crusher requiring low horse power. It gives a uniform product and has a wide range of reduction.

The Symons Disc Crusher

An improved type with revolving manganese discs which combine a rocking movement to prevent "packing" trouble when small sizes are crushed.



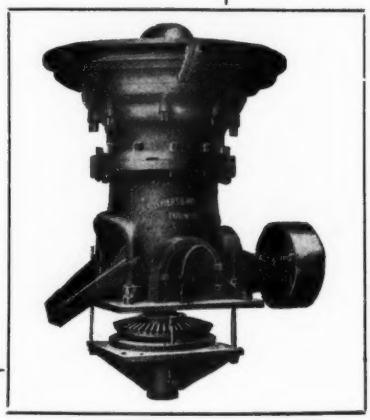


The Blake Rock Breaker

A sturdy design with minimum number of wearing parts. The crushing plates can be reversed and reused.

Bronze Ball Gyratory Crusher

A machine having a ball and socket seat for the main shaft to give a large bearing surface and to reduce re-babbitting to a minimum.



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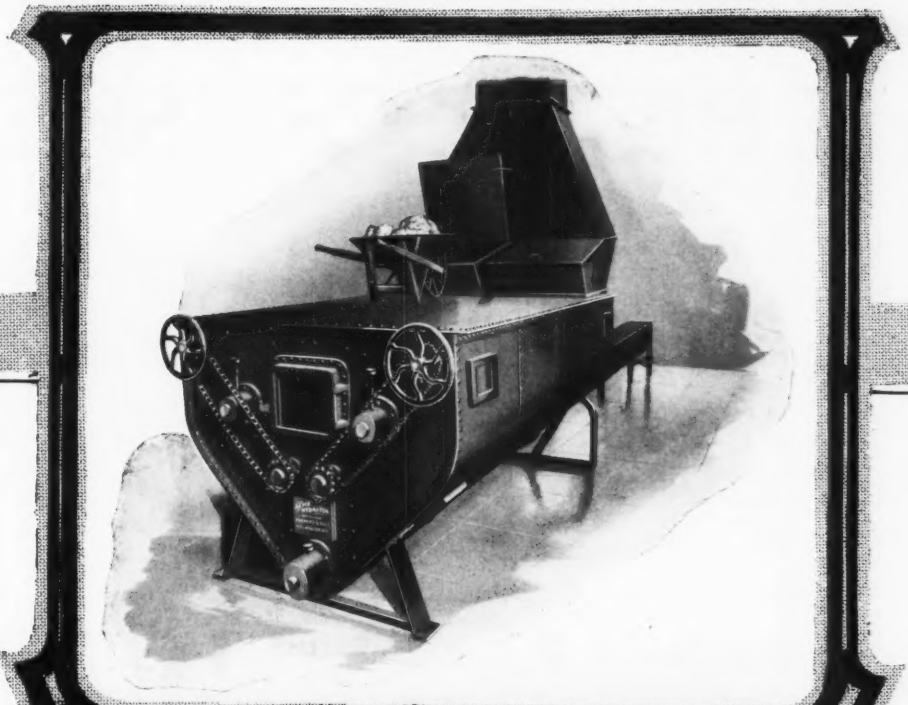

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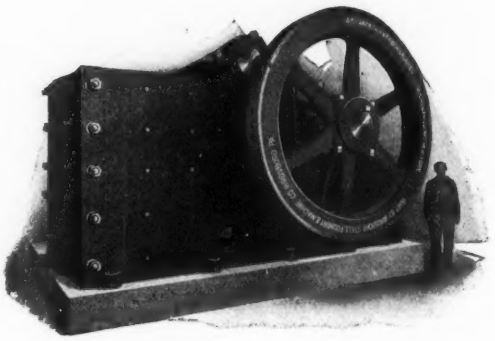

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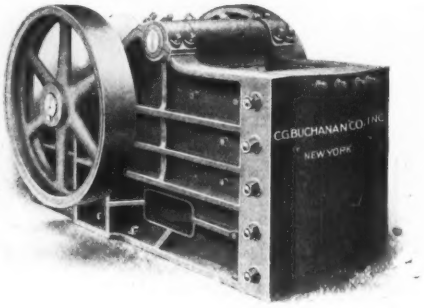

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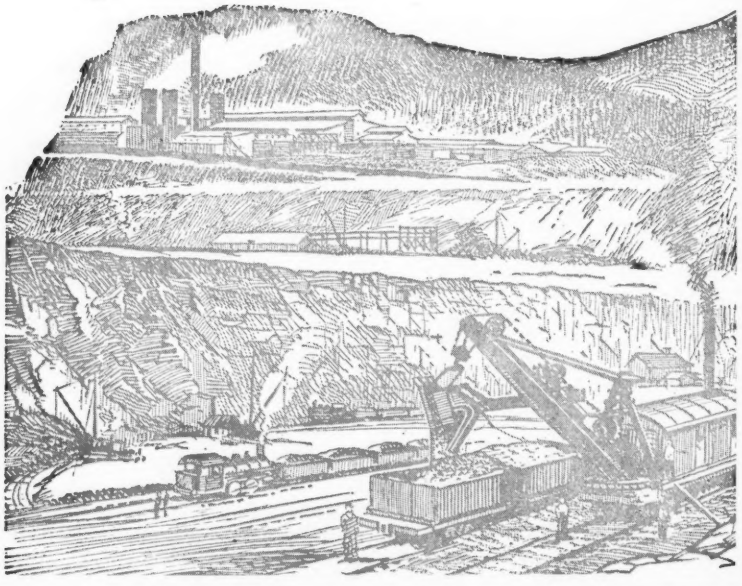
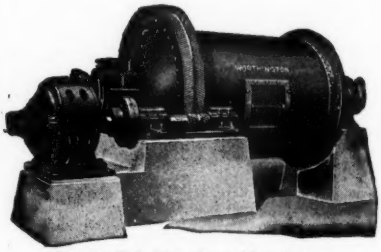
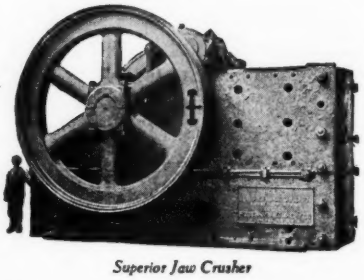


Superior McCully Gyratory Crusher



7' x 10' Tube Mill—Direct Motor Driven



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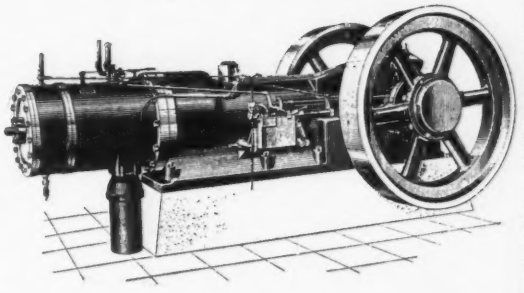

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Note the illustration below. It is that of the Illinois Road Paving Company with the PLYMOUTH in the focus—where good artists put the best stuff. Ask for literature.

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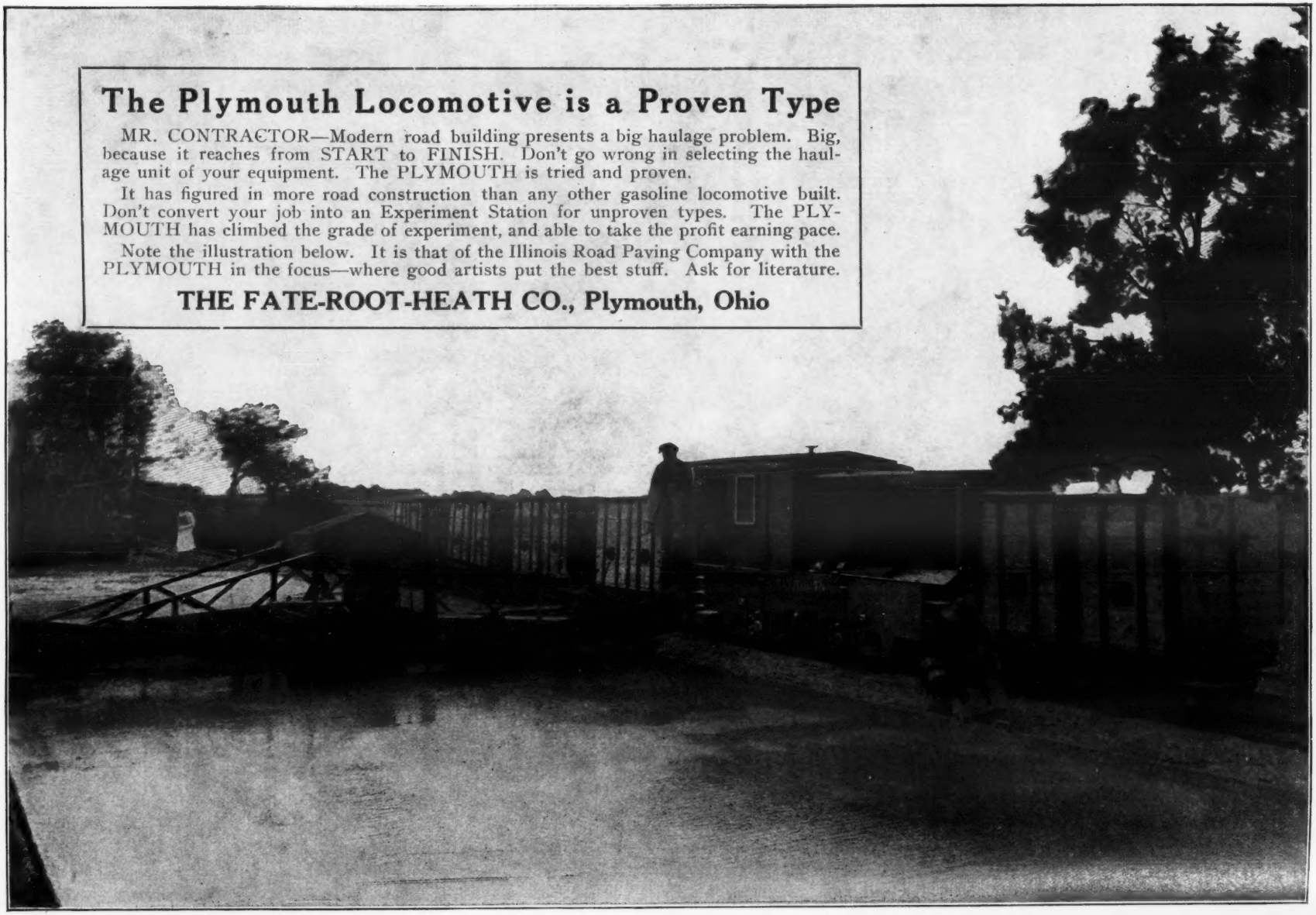


Rock Products

Vol. XXIV | Chicago, February 12, 1921 | No. 4

Wisconsin Sand-Lime Brick Plant

Acme Brick Company of Barton Has Up-to-Date Plant with Many Special Devices and Facilities

SAND-LIME BRICK is a comparatively new building material in America, its manufacture having started about 1901, but since then its progress has been remarkable. Putting this industry on a sure footing has not only benefitted the manufacturers, but also the public at large. In many parts of the country, clay of a quality required to make a good brick is scarce, and consequently brick cannot be had without shipping them for some distance. To the people in these localities sand-lime brick has been of a decided advantage. In a country where there is little clay, sand is usually abundant, and it is also usually of a good quality. Therefore, the ability to make brick from sand has placed within the reach of the users a durable and fireproof material. Sand-lime brick are usually sold as common brick, there being only a very small percentage of face brick made. It is possible, however, that in time a process will be invented whereby a good colored face brick can be made of sand and lime.

Located in a region where there is little or no clay and an abundance of good quality sand is the Acme Brick Co., of Barton, Wis. This is about 35 miles from Milwaukee, Wis., where the company finds a considerable market for its product. The sand here is of an even texture, containing but little gravel, and a few seams of sandy loam. The sand deposit

Character of sand deposit and track to sand storage

General view of plant of Acme Brick Co., Barton, Wis.

extends to a depth of 20 ft., and is 40 to 50 ft. high above the present working level. During the winter this bank of sand freezes, and it is then necessary to use dynamite to loosen up the deposit. An ordinary auger drill is used and the holes filled with 60 per cent gelatine dynamite. The amount of dynamite used depends upon the amount of sand needed.

Mining and Screening Operations

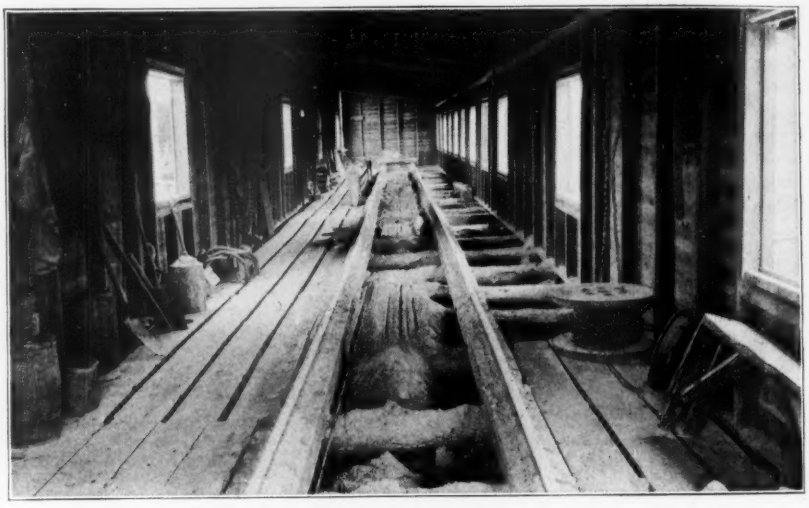
The mining operations at this plant are quite original and seemingly very efficient. The sand is stripped from the bank by means of a 20-ton tractor type steam shovel with a ¾-cu. yd. dipper and deposited into a portable screening device near the shovel. The screening plant is mounted on rails of 120-in. gauge and can be moved anywhere with comparative ease. The shovel deposits its load of sand into the hopper of the machine feeding a 6 x 10-in. bucket elevator of 12-ft. centers. The elevator deposits the sand into a 40-in. x 5-ft. rotary screen of ⅜-in. mesh. The material going through the screen falls into a hopper, from which the car is fed direct. A trap-door arrangement regulates the feed, the screen being set on an incline, and the rejections fall on to a small belt conveyor which conveys the material to the excavated portion of the pit. All of the apparatus is operated by a 5-h.p. direct-current motor.

The accompanying views illustrate the screening and loading mechanism very clearly. Only one car, of 2½-cu. yd. capacity, 38-in. gauge bottom dump type, is utilized for loading. A lever arm attached to a shaft and ecentric is placed on the side of the car. Attached to the eccentric are chains which are also fastened on to the bottom dump flaps. As the lever arm hits a cam beside the rails the eccentric is lowered, thereby releasing the flaps and dumping the material. Pulling the lever arm back into place raises the eccentric and chains, closes the flap gates, which are then locked by means of a chain attached to both lever arm and the body of the car, and it is so placed so as to permit a lowering of the eccentric but not a raising. After the car is loaded it is drawn up to the sand storage, which is a distance of 400 ft. from the present working face. The sand storage shed is 120 ft. long, 20 ft. above surface level, and the sand is dumped over track hoppers. An accompanying view shows the interior of the sand storage shed, which is capable of holding several weeks' supply of sand.

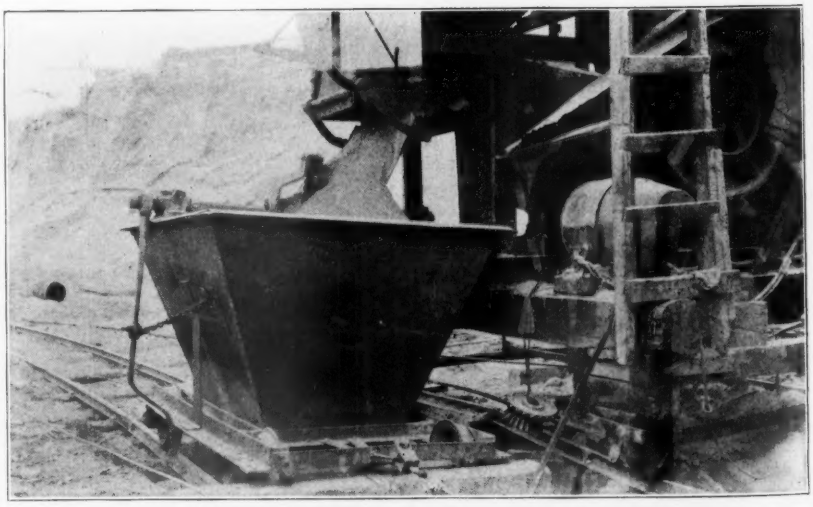
Lime Supply

After having finished the operation of securing the screened sand, the scheme of operation is to pass to the preparation of the lime. The company buys all its lime in bulk, and only that of a high calcium content. It is unloaded direct from cars into a special hydrator designed and built for the Acme Brick Co.

Portable screening and loading plant—steam shovel in back



Track hopper over sand storage



Loading from screening plant into car. Note lever arm and chains on car

This hydrator was designed especially for the sand-lime brick industry and is operated very successfully by the company. It consists of a pair of cylindrical drums, mounted to rotate on parallel axes, which are slightly inclined to the horizontal. The upper ends of the cylinders are closed while the lower ends are fitted with plates which can be moved in and out on the axis of the cylinder by means of screws. From each cylinder is a connection leading to a stack which carries away the steam generated.

A known weight of quicklime is dumped into the cylinder which rotates continuously. The proper amount of water is then added from a measuring tank and left in the cylinder until the hydration is complete, when the plate at the lower end is withdrawn sufficiently to leave a space of about 1 in. between it and the cylinder. The hydrated lime flows out through this opening and is picked up by a screw conveyor and taken to a Raymond air-separation pulverizer. These two cylinders are used alternately making the machine practically continuous. This gives the operator plenty of time to empty and charge one cylinder while the other is running. The amount of water and time of hydration varies from time to time, and is determined largely by experience.

A further description of the mechanical features of this hydrator appears in the new machinery and equipment department of this issue.

The material from the pulverizer is deposited into a hopper, feeding a screw conveyor directly above four steel storage tanks, each having a capacity of 10 tons. These tanks are all arranged in one row and insure a good supply of hydrate. Directly underneath the bins is another screw conveyor, so arranged that the hydrate can be taken from any one bin and delivered to the mixing machine near the sand pile.

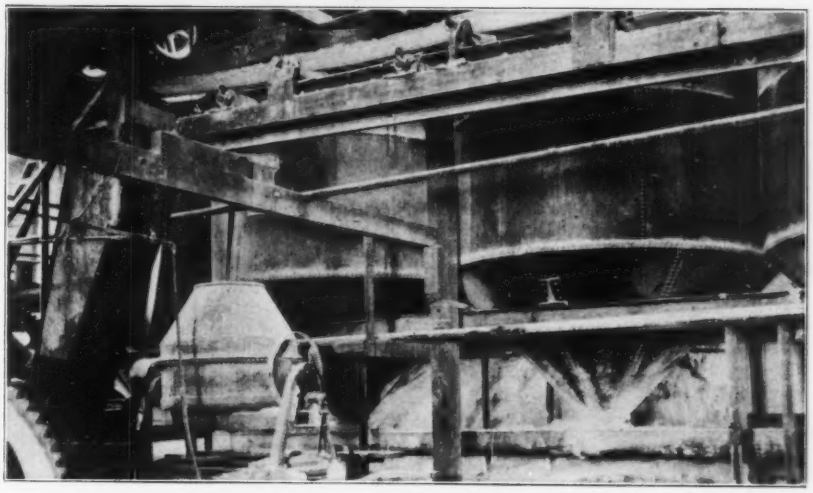
Mixing and Grinding

Between the sand storage and the lime storage is a central shaft containing the hopper feeding the rotary mixer. The shaft is a square column with tracks on either side, so that a charge of lime and a charge of sand are drawn up and dumped into the hopper at the same time. These cars are of the open-end scoop type mounted on wheels, and both scoops are drawn up the rails at the same time by one hoist.

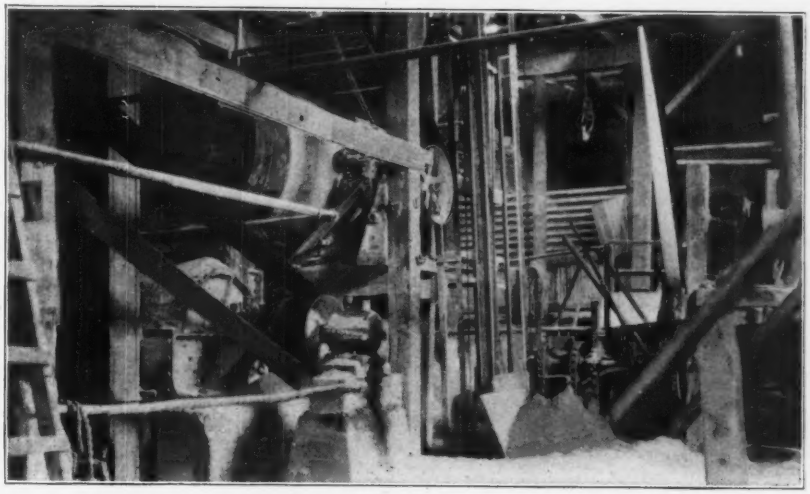
The sand is dragged from the storage by means of an improvised conveyor. It consists of a belt to which flights are attached operating in a narrow pit between two channels. The mechanism is controlled by means of a lever by a man who also operates the hoist.

The proper amount of hydrate and sand, in this case 12 cu. ft. of sand to 3 cu. ft. of hydrate, goes from the hopper to the rotary mixer. This is a very important step in the manufacture of sand-lime brick, for this operation usually determines the quality of the brick, so that it is necessary to take every precaution

Lime hydrator and screw conveyor underneath



Steel hydrated lime storage tanks



Mixer and central shaft leading to hopper

that the mixing be thorough and efficient, in order that the best results be obtained from the materials at hand. The machine used by this company is of the concrete mixer type and is always in continuous operation.

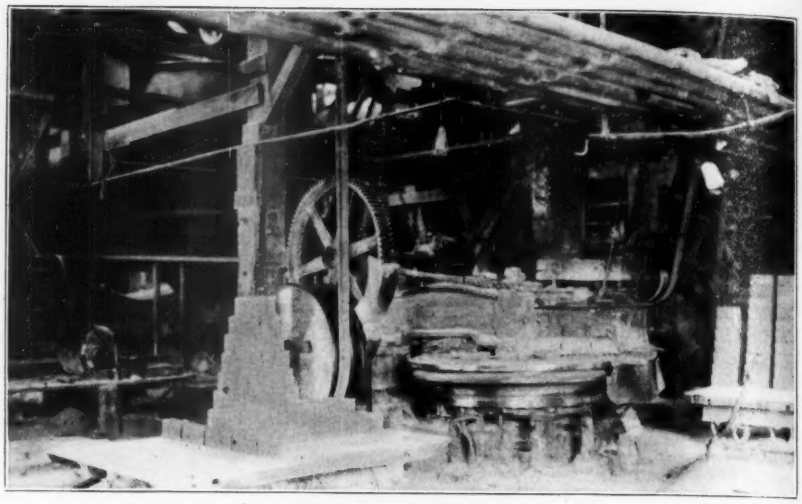
After leaving the mixer the material enters a hammer mill where it is pulverized. It is reclaimed from the mill by 7x14-in. bucket elevator of 34-ft. centers, which deposits the mixture in a steel storage tank, capable of holding enough mixture to make 18,000 bricks. This bin is so arranged that it can feed any one of four belt conveyors, each of which delivers the material to a double-screw mixer, where the water is added, and thence to the press. The amount of water added is a definite quantity, for if too much is added the brick cannot be properly pressed. If too little is added the brick is apt to crumble after pressing. The proper consistency is such that the material will stick together when pressed with the hand into a ball.

Pressing

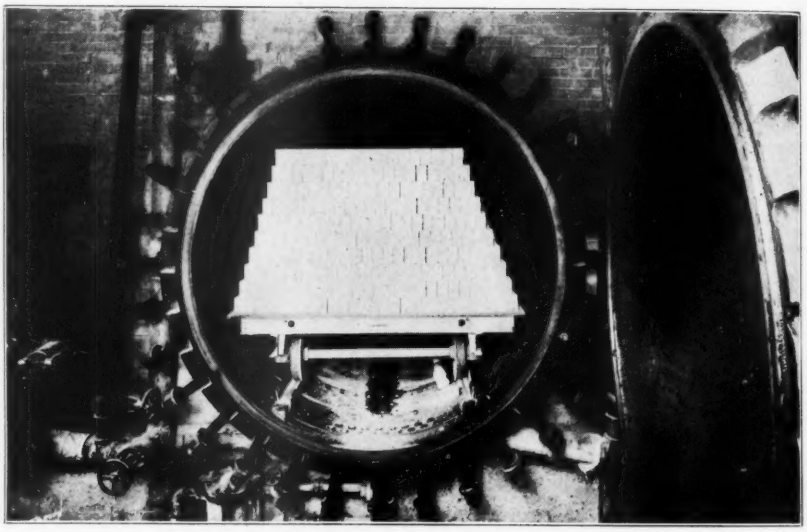
The four presses are all of the rotary table type. The pressing of the brick is also an important function for besides giving the brick its shape, it brings the sand and lime into very intimate contact, thereby facilitating chemical action. Also, the compression of the materials decreases the percentage of voids and produces a less porous brick, and the final strength of the brick is dependent upon the pressure exerted in moulding it.

Hardening Cylinders

The bricks are picked from the press table by hand and piled upon trucks. This operation requires considerable care for the bricks are very tender and easily crushed in the hand, at this stage of the process. As soon as the truck is loaded it is pushed by hand on tracks to the hardening cylinder.

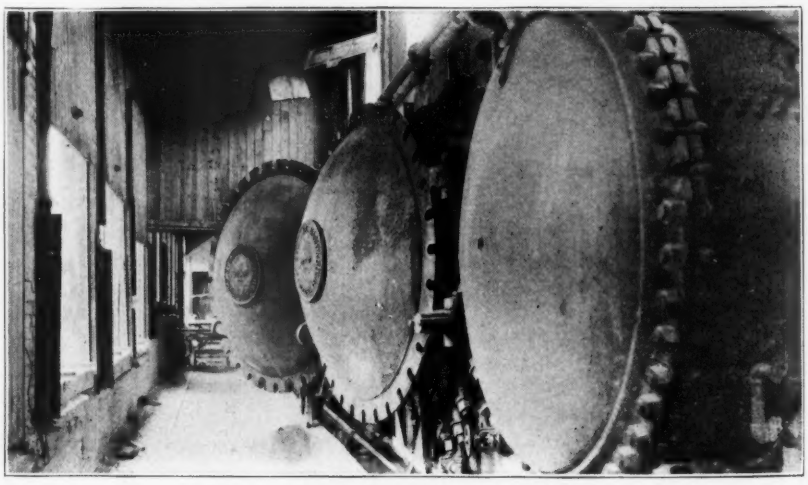


Rotary type brick press



Car loaded with brick in hardening cylinder

Loading platform



Battery of hardening cylinders with hinged covers

There are five hardening cylinders here. Three of these have their covers, or front ends, on hinges, while the other two are put in place by means of a small chain block. The cylinders are made of steel, and are built up of plates riveted together in such a manner as to withstand great pressure. The shell is set up horizontally and tracks for the cars are laid in the bottom of it. Each cylinder has a capacity of 17,000 bricks.

Curing the Brick

After a cylinder has been loaded to capacity the head is bolted on, and it is then subjected to steam pressure during the curing process. This operation takes place at night, while the press is only operated during the day. The steam pressure and the duration of the curing process are interdependent. A steam pressure of 135 lb. per sq. in. is maintained here, and the duration of curing is 7 hours. The cylinders are connected to each other by a series of by-pass valves in such a manner that the waste steam from one cylinder about to be opened can be used in another cylinder.

The trucks of bricks are taken out of the hardening cylinders, and immediately transferred to the loading platform, where the bricks are transferred to cars for shipment. Otherwise they are put into storage. The bricks are handled by tongs capable of holding 11 bricks, and one man can usually handle from 10,000 to 15,000 bricks a day with this implement.

Laboratory tests made of Acme brick at the University of Wisconsin have shown that the brick has an average compressive strength of 2800 lbs. per sq. in. and the absorption test is approximately 13 per cent. The brick is of a nearly white color, but this, of course, depends mostly upon the color of the sand. A well made sand-lime brick is uniform in color and size, and are characterized by their remarkably straight edges and perfect plane surfaces.

Power Plant

Steam is furnished to hardening cylinders and engine by means of two 150-h.p. tubular boilers. Both of the boilers are not operated at the same time. One boiler is operated during the day to generate steam for a 125-h.p. Corliss engine, which runs a central shaft to which all machinery is belted. The engine also operates a 22-h.p. generator, which furnishes enough current for lighting purposes, and for a 5-h.p. motor on portable screening plant. As it takes considerable time to bring the pressure up to 135 lb. the second boiler is operated and when the pressure is attained it is again put out of operation.

The president of the Acme Brick Co. is I. G. Toepfer; Charles J. Pokorny, secretary, and C. W. Wendt and J. Poppert are superintendent and sales manager, respectively. The offices are in Milwaukee.

Annual Meeting of Iowa Sand and Gravel Association

Action in Freight Rate Case Delayed—Will Consider Admission of Crushed Stone Members

THE IOWA SAND AND GRAVEL PRODUCERS' ASSOCIATION held its fifth annual meeting at the Hotel Savery, Des Moines, Iowa, Tuesday, February 7, 1921. Representatives from all sections of the state were present, representing 23 producing firms.

Upon recommendation of the executive committee the convention was limited to a one day business meeting. At 8:30 a. m., the executive committee met and audited the accounts of the secretary-treasurer and outlined the work for the day. After the registration of those present, the meeting was called to order by President R. C. Fletcher.

The secretary gave a resume of the association's activities, supplemented by a financial report. The financial statement showed a very creditable balance, and favorable comment was made by various members upon the progress shown during the past year.

G. H. Boynton, of the executive committee, introduced the question of an adjustment of existing freight rates, which had been deferred from the special meeting of December 14, 1920. The question of the policy to be followed in asking for changes in the freight schedule was then opened for general discussion from the floor. Since this question was one of vital importance to all producers in Iowa and one of the important questions to be brought before the convention, President Fletcher urged the fullest discussion possible, and to aid in obtaining this result called upon the various members who had not volunteered opinions.

Most of the forenoon was spent in discussion of the proposed freight rate change and its effect on various individual plants. Reports, graphs and various other data which had been compiled by C. C. Crouse, traffic expert of the Iowa Manufacturers' Association and the secretary of the Iowa Sand and Gravel Producers' Association, were presented for consideration.

Mr. Wiley, traffic expert for the Greater Des Moines Committee, gave a short talk on the prospects for a general downward revision of freight rates by the railroads themselves. He quoted figures to show that even with the increased rates, that the revenues had decreased because of lack of business, and that during the past few months the earnings of the large railroads of the nation were less than one and one-half per cent per annum.

The round table discussion on freight rates was then again taken up. Upon motion, the executive committee was instructed to advise with the various rate departments of the railroads, and with the members, and to obtain more data which are to be submitted at a later date.

Uniform Cost-Keeping—Publicity

The committee on uniform costs reported on answers to questionnaires received from various member companies. Some very interesting information was obtained from this data. Cases were noted in which two or three companies in different sections of the state would vary only a fraction of a cent per ton in their various costs for the year 1920. In general, the average costs were approximately 20 per cent higher than in 1919.

Floyd Goodrich, Iowa member of the executive committee of the National Association of Sand and Gravel Producers, was asked to report upon the activities of the National Association during the past year.

Upon motion, a committee was appointed, with M. R. Blanton as chairman, to have charge of general publicity and legislation. It was agreed in general discussion that all publicity possible be obtained toward furthering the cause of washed materials and the general use of sand and gravel, and that every effort be made to obtain new members for the coming year.

Upon the advice that the executive committee anticipated recommending certain minor changes in the constitution, Mr. Boynton requested that due consideration be given the question of admitting all producers of mineral aggregates, including slag and stone, to the association.

The executive committee advised an increase in the budget for the year 1921 and recommended maintaining the present rate of $50 and a three mill per ton levy on all 1920 tonnage produced—same to be paid quarterly upon receipt of statements from the secretary.

Officers Elected

The following officers were unanimously elected: President, R. C. Fletcher; vice-president, J. W. Pichner; secretary-treasurer, Gaylord E. Gray; chairman transportation committee, R. Snoddy; chairman membership committee, F. H. Goodrich; chairman specification committee, F. D. Pearce.

Production of Lime in 1920

Preliminary Report by the United States Geological Survey

ABOUT 3,350,000 SHORT TONS of lime, valued at $33,518,000, was produced and sold in the United States, including Porto Rico and Hawaii, in 1920, according to an estimate made by Herbert Insley, of the United States Geological Survey, Department of the Interior, from figures furnished by the principal producers. The quantity reported is more than that produced in any year since 1917 and is nine per cent more than that produced in 1919. It does not, however, quite equal the average pre-war production. The value of the lime produced in 1920 is considerably more than the value in any previous year. The average value per ton in 1920 was $10, in 1919 it was $9.50, and in 1918 $8.36.

Of the 42 states and territories that produced lime in 1920, 32 increased the output and only 7 decreased it as compared with 1919. Three states made about the same production as in 1919. The table shows the estimated quantities and values of total lime and hydrated lime sold in all states that produced more than 20,000 tons in 1920. The quantities for 1919 are also given for comparison.

The sales of hydrated lime in the United States in 1920, amounting to 846,000 short tons, were the greatest yet recorded, being 10 per cent more than those in 1919, the previous record year. Twenty-eight states produced hydrated lime in 1920, one more than in 1919. Of these 28 states, 21 produced more lime than in 1919, six produced less, and one made about the same production. Several states made very notable increases in their production of hydrated lime in 1920. Vermont made the greatest increase, 77 per cent, and Alabama came next, with an increase of 61 per cent. In 1919, Maryland made the greatest percentage increase in the production of hydrated lime, but in 1920 its output decreased nine per cent.

Building Lime

Most of the reports from producers indicated that the demand for building lime was greater in 1920 than in 1919. The demand fell off a little in the last three months of 1920, undoubtedly on account of the general business depression that began to be severely felt about that time throughout the country. As the shortage of buildings is as keenly felt as ever, this slackening in the demand for building lime can be only temporary.

Chemical Lime

The strong demand for chemical lime during the war fell off soon after the armistice was declared. In the last half of 1919, however, the demand began to increase, and in 1920 it was as good as the demand for building lime, if not better. Michigan, Vermont, Indiana, Virginia and West Virginia, most of whose lime output is sold for chemical uses, reported a much larger demand for chemical lime. Many producers found themselves unable to supply the demand owing to shortage of labor and cars.

Agricultural Lime

Producers of agricultural lime reported that the demand in 1920 was about the same or slightly less than in 1919. Lime for other uses was ordered so heavily that some producers found it impossible to fill orders for the cheaper agricultural lime. The production of burned lime for use in agriculture has decreased steadily since 1914, and the indications do not point to any early change for the better.

Other Lime

The demand for lime in other industries than building, agriculture and the chemical industry was in general very good and corresponded closely to that for chemical lime. Although a comparatively small number of producers make lime for use in metallurgy, the call for this purpose was apparently better than in 1919. There was a decided falling off in the orders during November and December, and a slackened call for lime for metallurgical purposes will undoubtedly continue until spring, as many smelters and steel furnaces have shut down or have materially decreased their output.

The unusual increase in the production of dead-burned dolomite is one of the interesting features of the lime industry in 1920. Dead-burned dolomite is used principally in lining basic open-hearth furnaces and is substituted for calcined magnesite for this purpose. In 1920, the imports of magnesite were renewed, although the quantity imported did not equal the average for pre-war years. The production of magnesite in California and Washington was greater than in 1919, but notwithstanding this increase and the increase in imports the production of dead-burned dolomite in 1920 was much greater than in 1919. In the following table only the material dead-burned by the quarrying company is represented. Considerable raw stone was probably sold by quarrymen and dead-burned by others, as in previous years, but figures are not available.

The present depression in the steel industry may cause a decreased production of dead-burned dolomite for a few

Lime produced in the United States in 1919 and 1920.

[Estimate for 1920; final figures in part for 1919].

	1919		1920				Increase or decrease in quantity, 1920.	
	Hydrated lime (short tons).	Total lime (short tons).	Hydrated lime (short tons).	Total lime (short tons).	Value.	Average value per ton.	Hydrated lime (per cent).	Total lime (per cent).
Pennsylvania	158,000	747,056	163,000	738,000	$6,550,000	$8.88	+ 3	− 1
Ohio	307,000	506,000	326,000	570,000	5,883,000	10.32	+ 6	+13
Virginia	(a)	224,385	(a)	256,700	2,066,000	8.05	+ 6	+14
Missouri	35,307	181,000	52,670	211,100	2,127,000	10.08	+49	+17
Wisconsin	23,470	123,759	32,300	161,000	1,672,000	10.32	+38	+30
West Virginia	56,222	141,000	49,380	141,000	1,310,000	9.29	−12	.....
Indiana	30,931	105,952	40,800	139,800	1,428,000	10.21	+32	+32
Massachusetts	(a)	124,000	(a)	126,900	1,388,000	10.94	+42	+ 2
Michigan	(a)	124,700	(a)	144,000	1,480,000	10.28	+33	+15
Maine	(a)	94,000	(a)	104,400	1,671,000	16.00	+ 6	+11
Tennessee	19,613	116,970	23,190	101,000	807,200	7.99	+18	−14
Illinois	(a)	64,164	(a)	94,400	934,800	9.90	+29	+47
Maryland	36,644	99,717	33,400	94,000	658,000	7.00	− 9	− 6
New York	(a)	79,528	(a)	81,930	1,000,000	12.20	+15	+ 3
Texas	18,914	51,205	21,900	55,900	564,500	10.10	+16	+ 9
Connecticut	(a)	(a)	(a)	(a)	(a)	11.00	.....	+ 6
Alabama	5,100	48,600	8,200	51,300	513,000	10.00	+61	+ 6
Vermont	(a)	38,150	(a)	47,100	503,200	10.68	+77	+23
California	(a)	39,000	(a)	40,000	492,000	12.30	−48	+ 3
Washington	(a)	21,236	(a)	26,330	583,500	22.16	+23	+24
Undistributed	78,734	142,703	95,160	165,140	1,886,800	.....	+21	+16
	769,935	3,073,125	846,000	3,350,000	33,518,000	10.00	+10	+ 9

a Included in "Undistributed."

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months, but the effect will probably be temporary.

Producers reported an increased demand for lime used in paper manufacturing and tanning.

Economic Conditions

Although more lime was produced in 1920 than in 1919, the supply was not large enough to meet the demand, not because of the inability of the plants to increase their output, for many did not operate at full capacity, but because of conditions beyond the control of the lime makers. The shortage of freight cars, although not so great as in 1919, was still so bad that many plants were forced to operate on part-time; there was a continued lack of skilled and efficient labor, particularly in the early part of the year; and fuel was often scarce and always high in price.

Nearly all lime producers reported higher prices in 1920 than in 1919, owing to the increase in cost caused by the operation of the plants for only part of the time, to inefficiency of labor, and to the high price of coal.

Notwithstanding the present business depression, there is every reason to predict better prospects for the lime industry. During the war and the period of readjustment, the lime industry labored under difficulties, for it was not regarded as an essential war industry. There has been no over-production of lime, and therefore there will probably be no great decrease in the output in the coming year. The conditions that are now adverse to building, paper-making, and the metal industries will react to some extent upon the production of lime, but any reduction in output from these causes will be only temporary.

Production by Commercial Districts

The following table shows the estimated quantities of lime produced in 1920 in the 14 commercial districts outlined by the National Lime Association, as well as the estimated production of those districts in 1919:

Lime produced in the United States in 1919 and 1920, by districts.

District.	1919		1920				Increase or decrease in quantity, 1920.	
	Hydrated lime (short tons),	Total lime (short tons).	Hydrated lime (short tons).	Total lime (short tons).	Value.	Average sale per ton	Hydrated lime (per cent).	Total lime (per cent).
1. Maine, Vermont, Massachusetts, Connecticut, Rhode Island, eastern New York.	37,985	376,722	43,420	405,500	$5,080,000	$12.53	+14	+ 8
2. Eastern Pennsylvania, New Jersey, Maryland, eastern West Virginia	227,320	764,757	227,280	781,800	7,155,800	9.15	.....	+ 2
3. Western Pennsylvania, western New York, western West Virginia	28,658	234,611	24,000	203,980	1,486,750	7.29	−16	−13
4. Virginia, North Carolina [a]	(b)	224,385	(b)	256,700	2,066,000	8.05	+ 6	+14
5. Ohio	307,000	506,000	326,000	570,000	5,883,000	10.32	+ 6	+13
6. Michigan	(b)	124,700	(b)	144,000	1,480,000	10.28	+33	+15
7. Illinois, Indiana, eastern Missouri	60,755	278,655	90,500	369,650	3,721,000	10.07	+49	+33
8. Wisconsin	23,470	123,759	32,300	161,000	1,672,000	10.32	+38	+30
9. South Dakota, Minnesota, Iowa	(b)	(b)	(b)	(b)	(b)	10.70	+13	+32
10. Kentucky, Tennessee	19,613	117,958	23,200	102,000	816,650	8.00	+18	−14
11. Alabama, Florida [c]	5,100	48,600	8,200	51,300	513,000	10.00	+61	+ 6
12. Western Missouri, Kansas, Oklahoma, Arkansas, Wyoming, Colorado	(b)	86,976	(b)	94,550	978,000	10.34	−22	+ 9
13. Texas, New Mexico	18,914	52,963	21,900	58,100	587,800	10.12	+16	+10
14. Western Montana, Idaho, Utah, Arizona, Nevada	9,831	86,284	11,200	103,920	1,515,000	14.58	+14	+20
Undistributed [d]	31,289	46,755	38,000	48,300	563,000	.....	.....	.....
	769,935	3,073,125	846,000	3,350,000	33,518,000	10.00	+10	+ 9

[a] Virginia only; North Carolina included in "Undistributed."
[b] Included in "Undistributed."
[c] Alabama only; Florida included in "Undistributed."
[d] Hawaii and Porto Rico also included in "Undistributed."

Chinese Cement Industry

EXPORTATION OF CEMENT from China has declined greatly during and since the war. The exports in 1913, amounting to 71,865 barrels valued at $128,110, had fallen off in 1919 to 3,130 barrels valued at $12,367. This decline, however, was counterbalanced by an increase in local demand, and the government cement factory at Canton is operating eight kilns at full capacity and turning out about 500 barrels daily. The product, though inferior to imported cement in quality, is much cheaper in price. The limestone for its manufacture comes from the North River district of Kwangtung Province.—U. S. Consular Report.

Ben Stone on the Building Outlook

ALMOST EVERY DAY brings fresh evidence that the adjustment of business, which has been in progress since last spring, is proceeding by natural processes. It is stated freely now by those in a position to know that liquidation in many lines has passed the low mark and that reaction is taking place. The general situation, however, as regards the construction industry is somewhat hazy.

There has been a great deal of discussion during the past 60 days—too much in fact—of the so-called problems confronting the construction industry, and, as usually happens, sentiment and thought have been badly mixed, with resulting confusion. The fact of the matter is that construction costs have already responded in many localities to economic pressure and are much lower today than a year ago.

It has been prudently pointed out that the cost of a building or construction job cannot be judged by the cost on any constituent part thereof, but must be arrived at by an assembling of all factors entering into the work, and it is being demonstrated right along, that given projects can be undertaken at the present time at much less aggregate cost than was possible a year ago.

It does not seem likely that there will be a building boom, such as some would have us believe is imminent, although in many localities activities during the year may approach that point. In those regions, however, where labor costs remain high, as reflected by money wages, the resumption of building and construction will undoubtedly be gradual, regardless of the fact that the actual labor cost now as compared with a year ago is much less because of the increased efficiency or production per man-hour.

Transportation is one big factor in the general situation that is especially favorable to work now under way or that can be started in the near future. No one believes that conditions affecting transportation have undergone any great permanent improvement. On the other hand, it is frankly stated by railway executives themselves that a general revival of business will embarrass the railroads in the matter of car supply and service. So it behooves those interested in building and construction to consider transportation in the light of its effect on the ultimate cost of whatever projects they may have in mind.

We believe great emphasis should be laid on this important factor and we also believe that in the case of a great many projects that are now prospective what little might be saved by waiting for further reductions in wages and materials will be more than offset by the excessive cost of delay that will result from a shortage of transportation which is sure to come later on. We repeat that all producers should urge every customer to take materials as early as possible and provide storage against future requirements.—Weekly Bulletin of the Illinois Concrete Aggregate Association.

Hints and Helps for Superintendents

Narrow-Gauge Railway Crossing

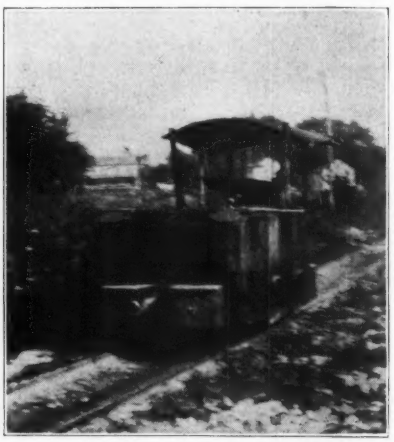
AT THE PLANT of the Connecticut Lime Co., Canaan, Conn., the narrow-gauge railway leading from the quarry to the lime plant—a distance of about a quarter of a mile—crosses the standard-gauge railway spur from the Central New England Ry. to the lime plant at grade.

As the train movements from and to the lime plant are not very frequent a permanent crossing has not been considered worth while. The section of narrow-gauge track, where it crosses the standard-gauge spur, is built on a removable section on longitudinal planks, properly cross-braced.

This section of track is simply picked up and swung inside the rails of the standard-gauge track, when the railway's locomotive is switching cars from and to the lime plant.

The narrow-gauge track is used by 6-yd. side dump cars, drawn to and from the kilns by the gasoline locomotive shown in one of the views.

Narrow-gauge crossing of standard-gauge railway track



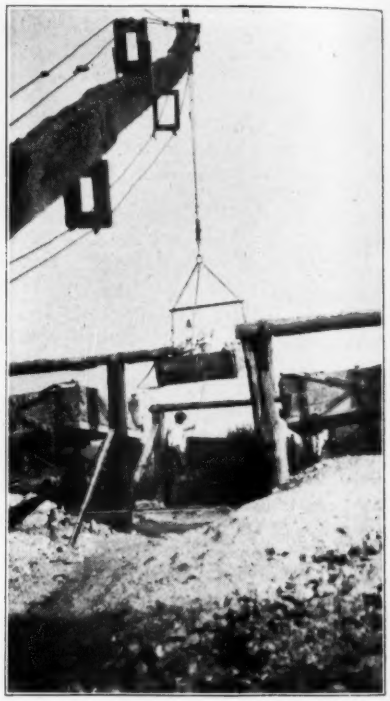
Locomotive used on narrow gauge

Improvised Skip Dumper

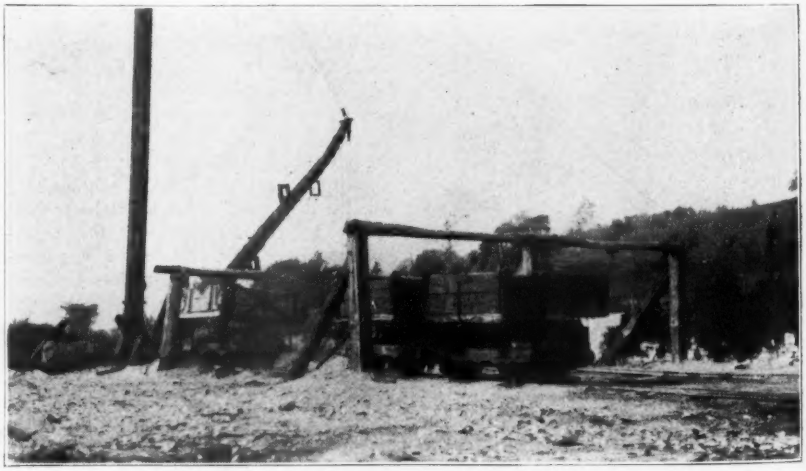
THE QUARRY of the Connecticut Lime Co. at Canaan, Conn., is a pit operation. Skips, carried on narrow-gauge railway trucks, are loaded by hand on the quarry floor and pushed under the boom of a derrick, erected at the edge of the quarry hole.

The derrick picks the skips off the railway trucks on the quarry floor and hoists them to ground level, by a hoist mounted near the base of the derrick.

To dump the skips the improvised method, shown in the accompanying views, is used. The narrow-gauge surface tracks from the lime plant to the quarry are run under



Skips hoisted out of quarry



Horizontal bars for dumping quarry skips into cars

horizontal bars. The hoist man manipulates the derrick and loaded skip so that the closed end of the skip comes to rest on the horizontal bar. Lowering on the hoisting line of course causes the skip to tip and discharge its load into the car underneath.

While the device looks very crude, it seems to work very effectively and of course requires a hoist with only one lifting line. The hoist has another drum to swing the derrick.

Track Layout for Motor Haulage

THE FIRST of the accompanying sketches (left) shows the ordinary fan-shaped layout of a quarry using hand-labor for loading cars, and gravity, or mule haulage to the crushing plant.

The obvious method of re-arranging the track system for steam-shovel loading is shown in the sketch to the right. This layout could however be considerably improved, where conditions permit, by carrying the loop to the end of the plant track shown, so that the empty cars could be hauled past the plant and returned to the quarry without backing up and switching.

Very often a layout like this can be so arranged that the cars will move in one direction by gravity, the locomotive merely bringing the loaded cars to the plant. In this case a switch and side track at the plant may be provided so that the locomotive can drop its string of cars and return to the quarry face for another, while the cars at the plant are being dumped. With the layout shown this side track is not necessary as the locomotive can push the cars from the rear, back up on the siding opposite the quarry face, and thus get behind another string of cars.

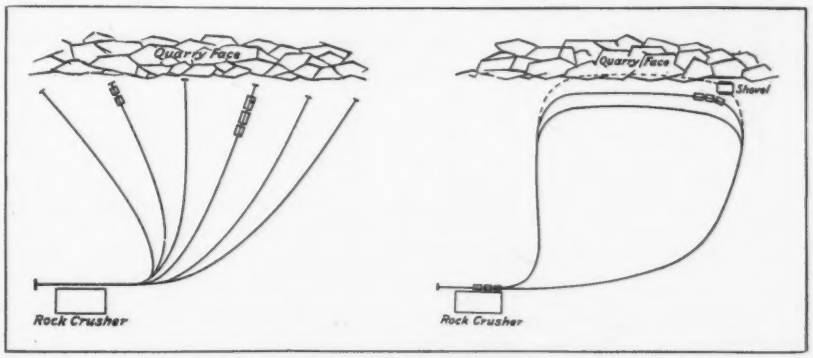
Device for Eliminating Excess Clay in Cement Mix

THE RAW MATERIALS for cement manufacture at the plant of the Southwestern Portland Cement Co., Victorville, Calif., all come from the same quarry. This quarry has a high cal ium limestone, shale and a nearly pure silica rock all in different parts of the same face.

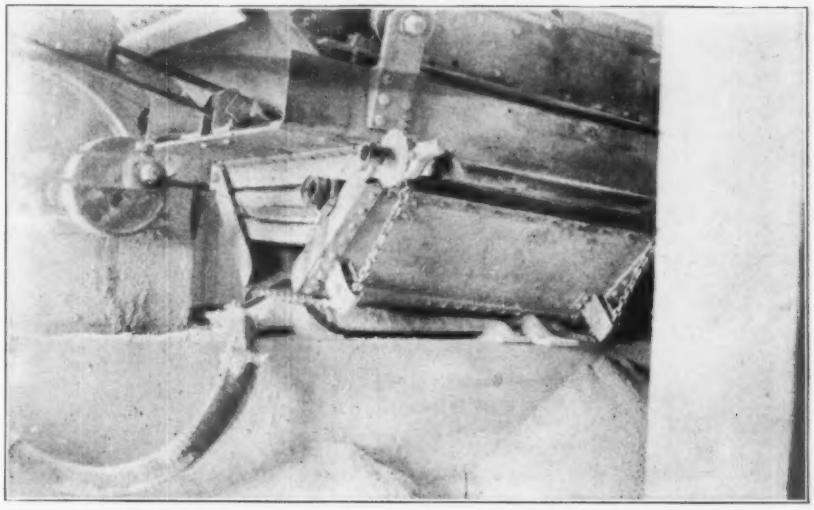
The limestone has some clay seams, which are occasionally struck. As steam shovels are used for loading the clay (or alumina) element at such times runs too heavy for the cement mix.

This excess of clay is gotten rid of at the crusher plant by the device shown herewith. Clay, shale, silica rock and limestone are all dumped together into the initial crusher. The product falls below through a special feeder, to a screw conveyor supplying the elevator to the hammer mills.

When an excess of clay is encountered a stream of water is turned on the material discharged by the feeder. This carries the clay silt down a trough against the tendency of the screw conveyor to carry it in the opposite direction. A conical screen at the end of the screw permits the fine clay silt to be wasted while any limestone or clay carried down by the water is brought back by the screw conveyor.



Track layouts for hand loading and shovel loading



Feeder for raw materials in portland cement manufacture

Device for washing out excess of clay in cement mixture

Welding the Frame of a Large Jaw Crusher at Quarry

Thermit Weld of the Side Frame of a 36x54-in. Steel Jaw Crusher

THOSE WHO attended the Toronto convention of the National Crushed Stone Association were treated to some interesting moving pictures of the process of welding the broken side frame of a large steel jaw crusher. Following is the complete story of this job, which was witnessed by the editor last fall.

While the large primary crusher operating in Plant No. 2 if the Edward Balf Co.'s quarries near Hartford, Conn., was engaged in crushing trap rock, the chute into which the material falls from the bottom jaw opening became clogged. This clogging in turn choked up the jaw hopper with material. As the rock was fed into the crusher close to one side frame a severe strain was thrown on the frame at this point. It so happened that this side frame had previously been broken near this corner and the two parts had been afterwards held in place by clamping the two broken sections together.

The strain caused by choking of the jaw with material bent the side frame outwards where the parts were clamped. This bending in turn threw a terrific strain on the other side frame at the opposite rigid corner. Something was bound to break. The safety toggle of the pitman refused to break, with the result that the end of the side frame at the opposite corner from the clamps was sheared off entirely along the edge of the keyway where the rear head fits into it.

Nature of Fracture

The line of fracture ran somewhat diagonally down through the side frame, extending from about 3 in. from the end of the casting at the top to about 5 in. from the end at the bottom, the length

Trap rock quarry of the Edward Balf Co., near Hartford, Conn.

of the fracture measuring somewhat over 3½ ft. The section at the break, the total width of which was 12 in. contained two shallow pockets surrounded by 3-in. thick walls, as shown in an illustration.

Considerations Affecting a Repair

As the accident occurred during a very busy summer period, the production of the company was very seriously curtailed. The normal producing capacity of about 1000 tons of crushed rock per day was reduced to only around 450 to 500 tons, or a decrease of about 50 per cent.

While normally all material was first fed into this primary crusher and from thence distributed in reduced size to the smaller gyratory crusher, it now became necessary to pick out smaller pieces of rock from the quarry and feed them directly into the gyratory crusher.

A new side frame would have cost from $2000 to $3000, not including the cost of machining it for installation, nor the loss of production, amounting to around $800 worth of trap rock per day, while awaiting the slow delivery of a new side frame. The casting was therefore inspected with a view to welding it, and as a Thermit welding repair was considered feasible, this method was chosen.

Preliminary Steps in Repairing Side Frame

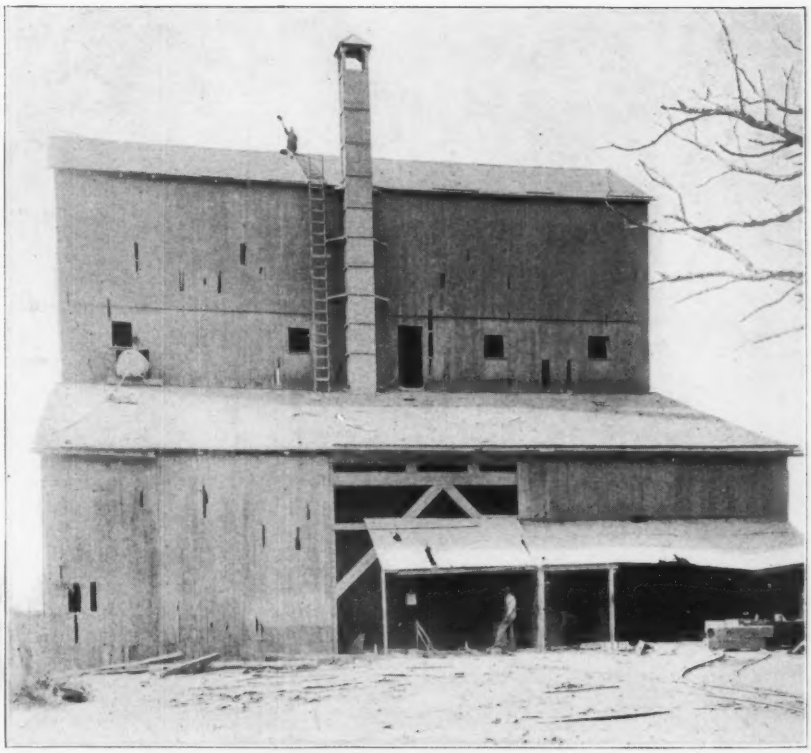
It would have been possible to weld the frame in place without removing it from the crusher, but as the machine had to be dismantled, anyway, to allow the other broken side frame to be replaced by a new frame which already had been ordered several weeks beforehand, it was decided to remove the casting and weld it outside the crusher building.

The frame was propped in a vertical position by means of wooden beams. Small openings were then cut out at the broken sections by means of the oxy-acetylene torch in order to allow space for the steel generated by the Thermit reaction later to enter. After these openings were cut out the faces of the broken sections were chipped with a pneumatic chisel and thoroughly cleaned with a wire brush. The two interior pockets, which contained molding sand and chaplets used in making the original casting were also carefully cleaned out.

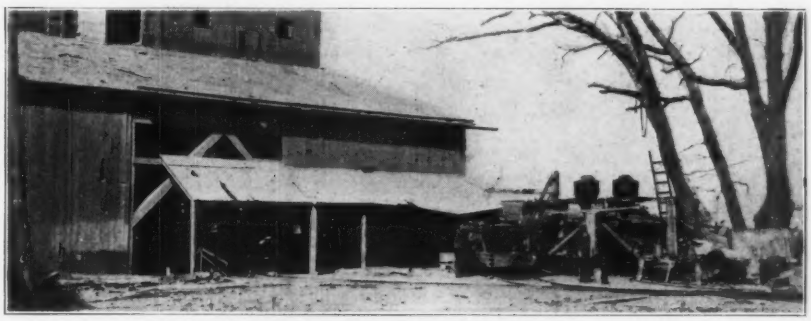
Lining Up Broken Sections and Applying Pattern Wax

The next step consisted in lining together the two broken sections in order to bolt the end piece in position. Two 2-in. bolt holes were drilled through the end of the piece and the piece then bolted to a cross-rib in the side frame.

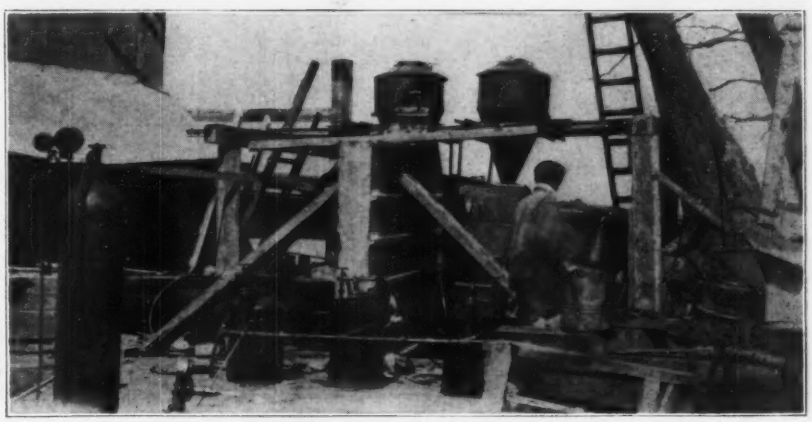
An opening about 2 in. wide was left between the two sections for the metal comprising the weld. After a trial adjustment the end piece was temporarily removed in order to permit application



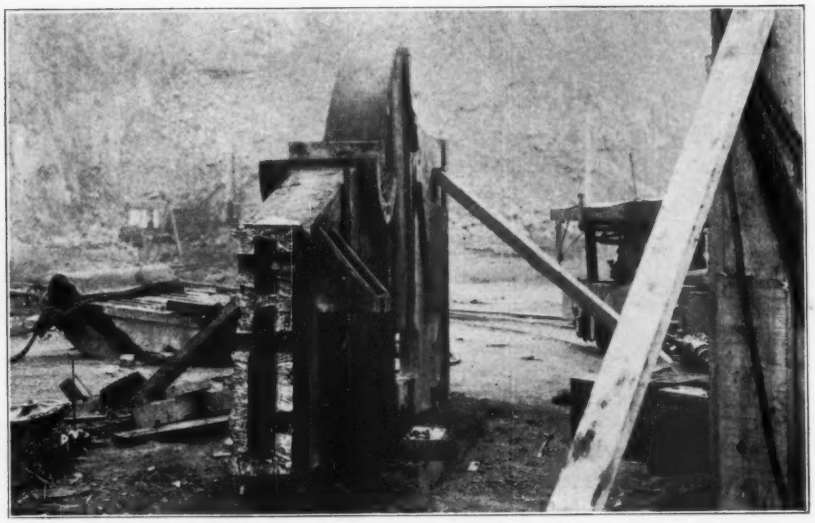
General view of the crushing plant



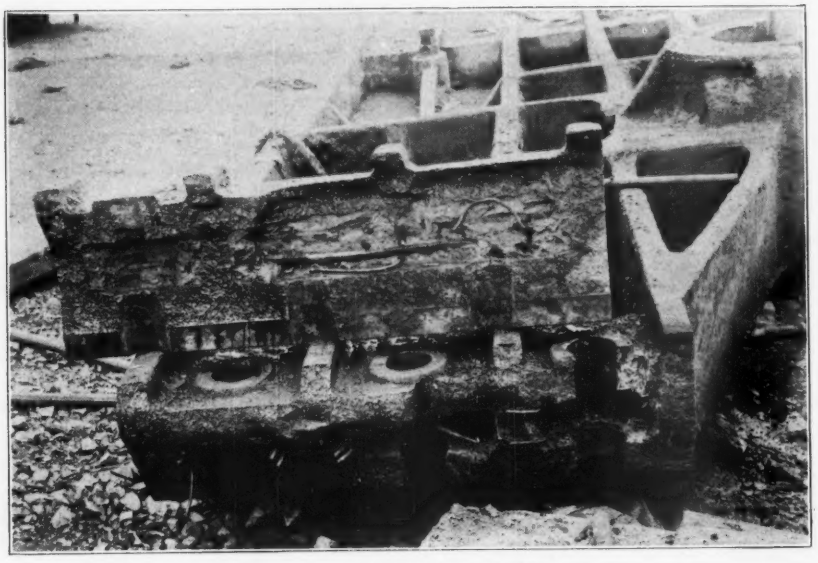
Thermit welding apparatus set up



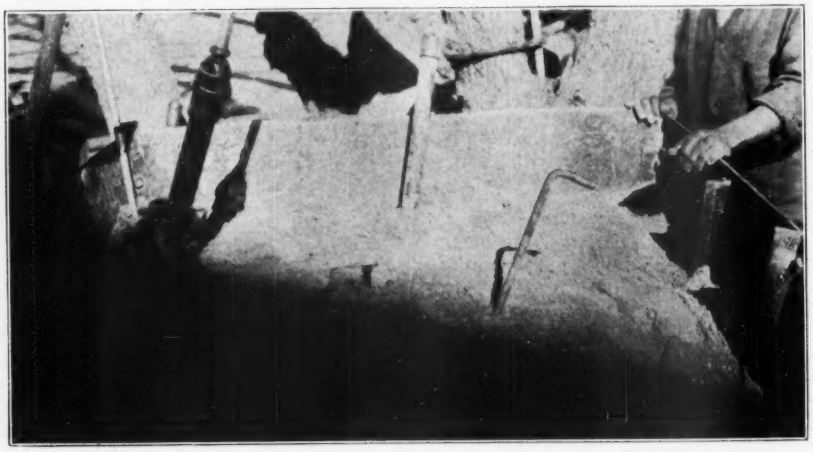
Near view of welding apparatus



Break in the side frame of steel jaw crusher



Another view of break in steel side frame



Box holding molding material around break showing venting rods, pouring gates and riser patterns

of yellow pattern wax around the inside edges of the fracture, also to allow molding material to be rammed into the two 4-in. deep pockets. Meanwhile a hole was drilled through a horizontal rib in the small outer piece in order to facilitate escape of the hot gases when the weld was poured. The end piece was then readjusted and a layer of wax applied adjacent to all fractured parts. Care was taken to insert molding material rather than wax in the three frame bolt holes for bolting the side frame to the rear head.

Final Operations

A large square sheet-iron box, 39 in. x 36 in. at the base, 59 in. x 55 in. on top, and 74 in. high, was next built around the fracture, and securely bolted in place. The inside of the box was then tightly rammed with molding material according to the usual method followed in Thermit welding. Three wooden heating gate patterns were inserted in each side of the mold box, directly above one another.

One riser pattern was inserted at the top of the fractured side frame.

The function of a riser is to hold a supply of steel which will remain liquid for a considerable period of time and take care of all shrinkage so that when a pipe is formed, due to shrinkage, this pipe will appear in the riser and not in the weld. Also the riser acts as a depository for loose sand or other foreign matter which may be washed into it by the Thermit steel in passing through the mold and prevents this material from clogging in the weld.

Owing to the large size of the fracture three double-burner preheaters were used to preheat the weld, the preheating also serving to burn out the yellow pattern wax from the mold and to dry out the mold. Preheating was started at 8 o'clock one morning and continued until 4 p. m. the same day.

At this time 1000 lbs. of Thermit, which is a mixture of iron oxide and aluminum, were placed in two crucibles suspended over the mold. A small amount of special ignition powder placed on top of the Thermit was then ignited, causing a chemical reaction to take place as a result of which super-heated liquid steel and slag (aluminum oxide) was formed in about 35 seconds at the intensely hot temperature of about 5000 degrees Fahr. The liquid steel thus formed was precipitated to the bottom of the crucible. At the completion of the reaction the molten steel was tapped through the bottom of the crucible into the mold, thus supplying the metal for the weld.

Restoring Crusher to Service

Ample time was allowed for the weld to cool slowly. The mold was then dismantled and the riser and pouring gate metal cut off. Owing to lack of facilities for machining the weld on the inside

Putting pieces of side frame together preparatory to making weld. Note bolts to hold two pieces together. Ramming molding material into interior pocket

Ready for building the molding material box around the fracture. Yellow pattern wax applied to keep molding material out of weld

Making the mold around the fractured side plate. Ramming the material around the casting

Completed weld before removing the pouring and heating gates. Was finished by pneumatic chipping tools

where the rear head fits into a keyway, the metal at this point had to be chipped off with a pneumatic chisel. The welded side frame was finally reinstalled in the crusher and operation restored at full capacity.

Moving Pictures Taken of Repair

Moving pictures were taken of all the steps of this job. The setting where the repair was made proved to be admirable for the production of an interesting industrial film.

The Metal & Thermit Corporation, New York, made the repair.

Merger of Alpha Portland Cement Co. and Cement Securities Co. Before Stockholders

FOLLOWING press reports from Denver, Colo., of a merger of the Alpha Portland Cement Co., Easton, Pa., and the Cement Securities Co., Denver, it is learned authoritatively that the proposition will be placed before the stockholders of the companies for ratification at an early date; the proposal will cover a surrender of shares by stockholders in present companies for shares in the new company, to be known as the Alpha Cement Co., capitalized at $30,000,000. The Alpha Co. is now operating plants at Alpha, N. J.; Martin's Creek, Catskill and Greenville, N. Y.; Manheim, W. Va.; Ironton, O.; Belleville, Mich., and La Salle, Ill. Gabriel S. Brown is president. The Cement Securities Co. has plants at Ada, Okla.; Concrete and Portland, Colo.; Devil's Slide, Utah; Trident and Hanover, Mont. Charles Bottcher is president. The merger will permit effective distribution in any part of the country of the Alpha brand without excessive railroad haul and there will be a consequent saving in freight charges, as well as still greater assurance of prompt service.

Ralph Gypsum Co. Discovers Rich Deposit of Rock

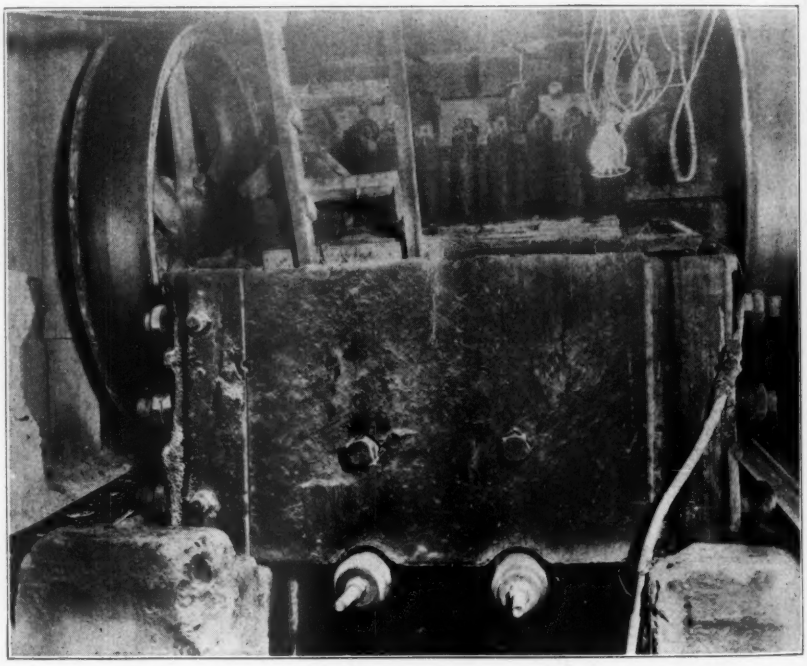
A DRILLING company working on leases owned by the Ralph Gypsum Co., of Akron, N. Y., has struck a 14-foot vein of gypsum on the Davy farm on the line between the towns of Le Roy and Byron, N. Y. George J. Ralph, president of the company, is exhibiting specimens of a high grade white gypsum taken by the core drill.

At the same time he announced the location of the big vein, Mr. Ralph, who is an experienced gypsum miner, announced that he had leased more than 3,000 acres of gypsum in Le Roy, Stafford and Byron, and test holes in several farms on the mile-square tract had resulted in the locations of gypsum in veins varying from 6 ft. to the 14-ft. vein.

Mr. Ralph, who was one of the founders of the Genesee Stucco works in Akron, afterwards sold to the United States Gypsum Co. and of the Akron Gypsum Co., said the presence of such a large quantity of gypsum on the mile-square tract would give his company control of the gypsum industry in the eastern states. The supply was sufficient to last fifty years, he said.

Mr. Ralph said the present capital of the company, $250,000, would be increased to $1,500,000 in the spring, and that mining will be started in April. The company plans to build a mill in Byron near the South Byron station. Gypsum was found at various levels on the farms under option, the latest discovery being at 54 feet below the surface.

Thermit reaction in progress. Temperature of 5000 deg. F. was created



Repaired crusher back in place in pit

A Modern Sand and Gravel Plant

Rubber City Sand and Gravel Company of Akron, Ohio, Handles Material Entirely by Belt Conveyor

HANDLING 2500 tons of sand and gravel per day from the point where it comes out of the pit to the washing and screening plant entirely by belt conveyors is an unusual sand and gravel operation. There are a few such plants, but not many that have steam-shovel pit operations and a capacity as large as that of the Rubber City Sand and Gravel Co., Akron, Ohio.

Deposit and Method of Excavation

The company has a total of 150 acres of sand and gravel deposit in Krumroy, a few miles from Akron, which is located in the heart of that fine sand and gravel belt of northern Ohio. The bank is at present about 48 ft. high and contains a material of very excellent quality. There is also every indication that the same material extends to about the same depth below present pit working level.

To excavate the material, a 60-ton standard-gauge railway type steam shovel with a dipper of 2½ cu. yd. capacity is used. The material is dumped into a movable hopper, which straddles a 30-in. belt conveyor. The hopper has a capacity of about 5 cu. yd. and is moved along the conveyor of portable track on either side. A special feeding device is provided for the hopper, as is shown in one of the accompanying views. This is controlled by a man at the handwheel, thereby insuring an even flow on the belt conveyor.

The 30-in. belt conveyor underneath the hopper is parallel to the bank and is now about 1000 ft. in length. It is erected on wood sills and stretchers and can be moved in any direction desired. It is operated by an electric motor.

Crushing Plant

The material from the field belt conveyor discharges into a hopper, which in turn deposits the material on to a short 30-in. belt conveyor set at right angles to the field belt conveyor. This short conveyor elevates the material to a second hopper feeding to a revolving scalping screen passing 2-in. material. The fine material passing through the screen falls into a third hopper which is directly above a conveyor belt, which takes the material to the washing plant.

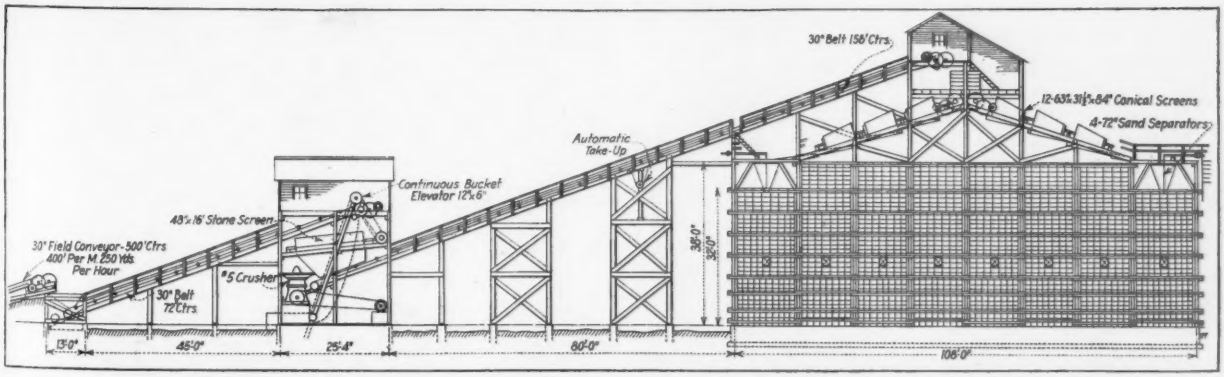
The rejections from the scalping screen are chuted direct to a No. 5 gyratory crusher, and after passing through the crusher are reclaimed by a 6 x 10 bucket elevator which again deposits the material in the scalping screen. This process is repeated until all material goes through the screen.

Washing and Screening

All the material under 2-in., received

General view of the sand and gravel pit

Steam shovel loading belt conveyor in pit



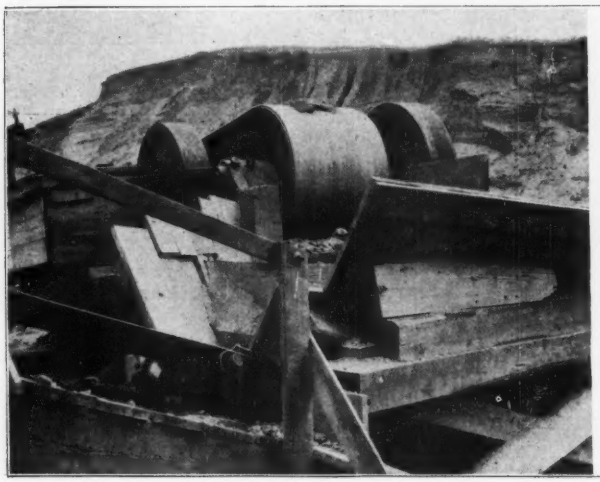
Elevation of the new sand and gravel plant of the Rubber City Sand and Gravel Co., Akron, Ohio

Portable hopper for loading belt conveyor

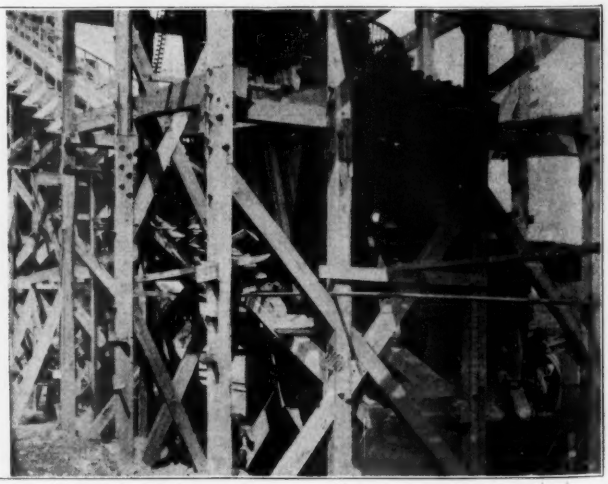
Steam shovel and portable hopper in pit

Looking along the conveyor toward the plant

View from top of screening plant



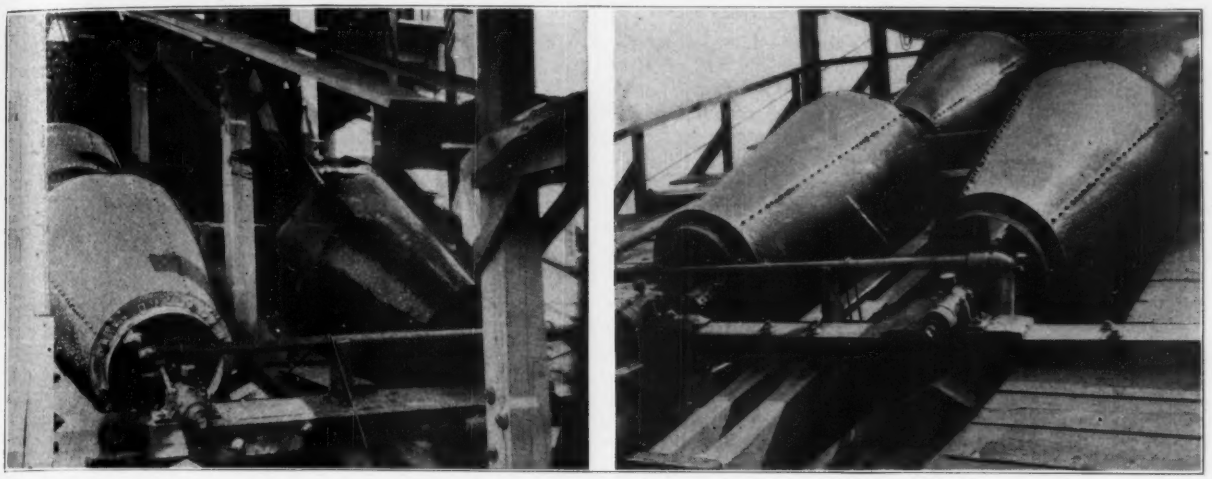
Top of belt conveyor discharging to screens



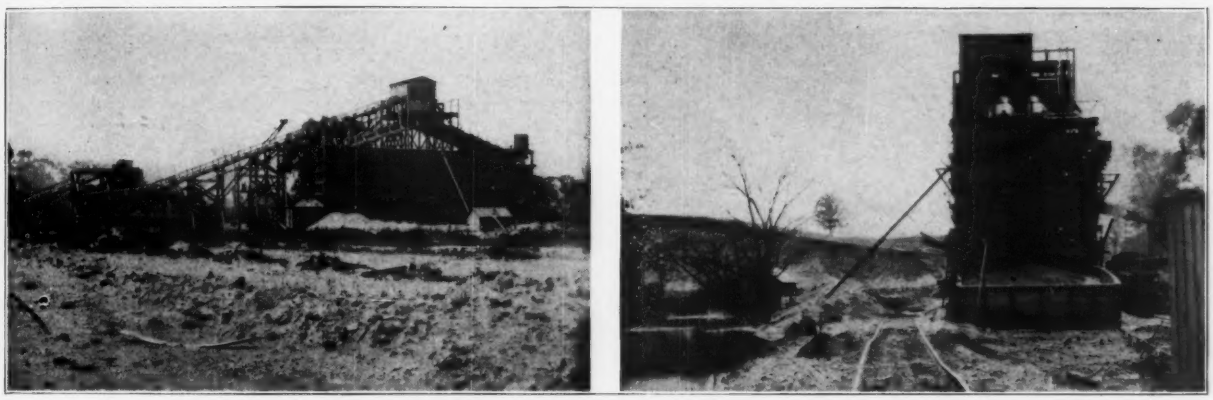
Crushing plant with No. 5 gyratory crusher

by the 30-in. belt conveyor is elevated 53 ft. to a receiving hopper where it is mixed with water. This hopper is divided into four sections; that is, there are four holes in the bottom of the hopper, and the material is washed through these holes, which are 10-in. pipes, by nozzles of water playing directly upon the material.

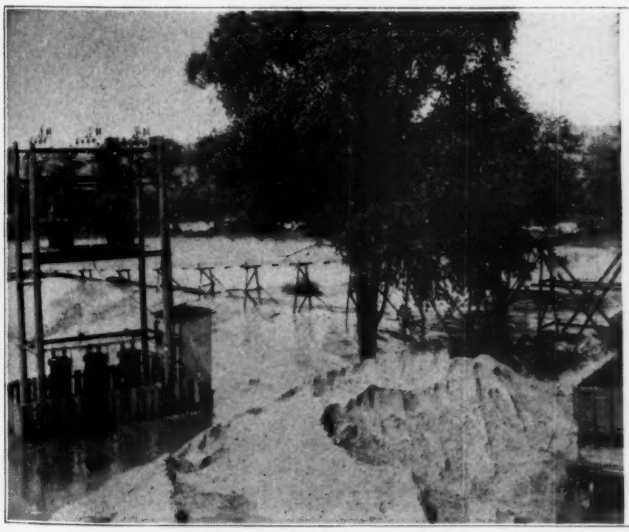
This washing plant is really two plants in one; that is, there are four sets of inclined conical screens, two sets to each unit. The material as it is washed through each of the four 10-in. pipes goes to one of the four sets of screens. This material first goes into a 1-in. conical revolv-



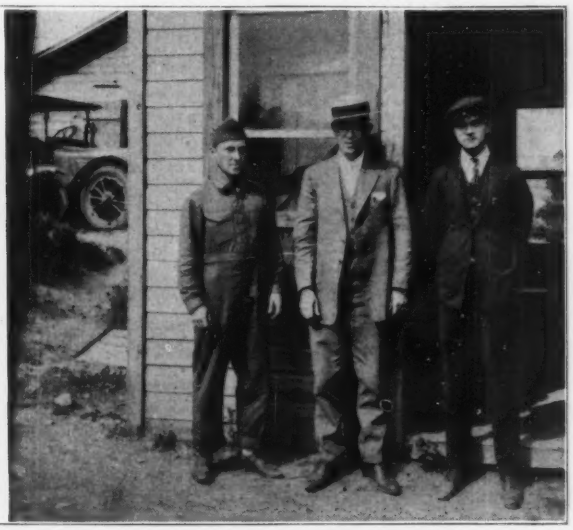
Battery of conical screens; also showing water-piping system



General views of plant; right-hand view shows pond for water supply



Electrical transformer station for plant



C. L. Turnbull, H. G. Knight and W. G. Harris

ing screen. The oversize is taken out and the finer stuff goes by gravity to a ⅝-in. screen. Here the process is the same and the material goes then to a ¼-in. screen. The rejection of this ¼-in. screen is the coarse sand.

Each screen has a stream of water playing upon the material as it is being revolved, so that the material going to the bins receives a thorough rinsing. Underneath each screen is a steel pan which takes care of the water and screenings, fluming them into the next screen.

The sand at the end of the system of screens is flumed to four conical automatic dull sand separators. The operation of these separators depends upon the weight of the sand in the tank. When filled to a certain point the weight of sand overbalances counterweights. This automatically opens the valve at the bottom, allowing the sand to discharge into the bin below. An overflow spout is provided at the top of the tank where the bulk of the water laden with clay and dirt passes to a sluiceway leading to a lake or settling pond.

The company can get any desired mix of gravel by simply turning the sluice pans under the screens into different bins.

Pumping Unit

The water for the washing plant is taken from the Tuscarawas River by a 10-in. centrifugal pump which is situated in a pump house. The water is pumped through a 10-in. pipe and elevated to the top of the plant which is a total lift of 65 ft.

Equipment

All the machinery in the plant is run by individual electric motors. Material can be loaded into cars from either side of the plant. There are 16 loading spouts in all, 12 for gravel and 4 for sand. On either side of each unit there is a bin for sand storage. To reclaim the material from these bins a locomotive crane with a 1½-cu. yd. grab bucket and 50-ft. boom is used. It is also used to load material from the storage pile into trucks and cars.

Material for storage is loaded in 12-yd. side-dump standard gauge cars, which transport the material from the plant to the storage pile. The company has four such cars and a 44-ton switch engine is used to make the haul to and from the storage pile. This locomotive is also very handy for general switching service about the plant.

To complete the equipment is a 120-ton track scale properly certified by the railway authorities. This tends to increase operating capacity, as the cars are sent direct to the producers without having to be taken out of their way to railway scales.

The company buys its power from the Northern Ohio Traction and Light Co. It takes the current in at 22,000-volts and steps it down to 440, under which voltage all the equipment is run. The total horse power required is 265.

Organization

The company, which is composed of Akron's leading men, was organized in June, 1919, and is incorporated for $500,000. M. A. Knight is president of the company; A. D. Armitage, vice-president; Harry Williams, treasurer; John Grimm, secretary; H G. Knight, general manager, and Joe Berkenfield, superintendent.

The plant has a capacity of 60 cars per 10-hour day, and has had little trouble in getting rid of all the material it could ship, as there is quite a demand for sand and gravel in Akron and vicinity.

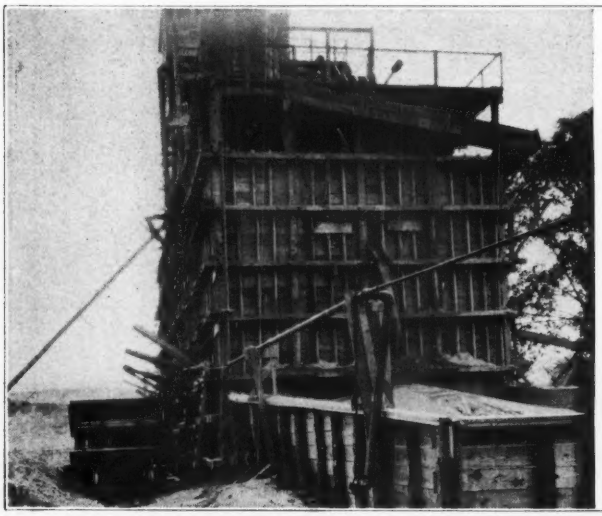
H. G. Knight, general manager of the plant, is a mining engineer, a graduate of the Colorado School of Mines. He has spent nine years as a mining engineer among the gold mines in Alaska. W. G. Harris, traffic manager, and C. L. Turnbull, his assistant, have amply proved that a sand and gravel company can utilize a traffic department to very great advantage.

The plant, which is just a year old, was designed and equipped by the Link-Belt Co., and it is claimed to represent the very latest in sand and gravel plant design.

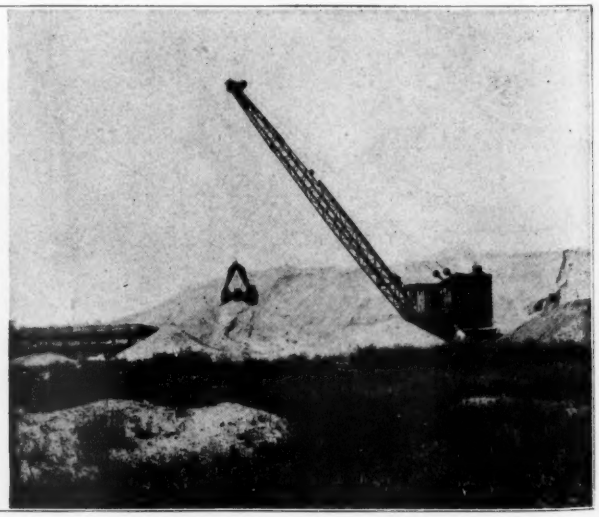
Gravel Survey in Iowa Brings New Competition

IOWA GRAVEL HUNTERS, working under the direction of the State Highway Commission, have been largely influential in starting many new town and county pits in operation, according to a statement given out at the highway commission offices at Ames. The statement continues:

"Technically speaking, the gravel hunters were conducting a survey of the road-building resources of the state. In this survey, undeveloped gravel deposits were examined in 24 counties, and searches made for entirely new deposits. Through the efforts of the department, new gravel deposits were found and opened up, and used as the sole supply for a number of paving jobs. In several instances, however, had the deposits not been located, it would have been impossible to proceed with the contract because of inability to secure the needed coarse aggregate. Technical inspection and tests were made from time to time of the quality of the material being produced at 18 of the larger commercial gravel supply plants, whose product was being used on primary road construction projects.



Car-loading facilities of the plant



Ground storage handling facilities

Sand and Gravel Survey of the U. S. Bureau of Public Roads*

Government Collected Data Shows How Transportation Shortage Paralyzed the Industry—Finds Lax Business Methods

By Geo. E. Ladd
Economic Geologist, U. S. Bureau of Public Roads

DURING the year 1919, when road-building programs in this country had begun to assume enormous proportions, an acute shortage in freight cars developed which soon seriously interfered with both new construction and repairs of roads. The United States Bureau of Public Roads, having in charge the great Federal Aid Highway Projects, needed accurate information as to the magnitude of funds provided, work projected, and road materials available. It had in its files complete data on the two former subjects, but found that neither the Government nor any agency had an up-to-date, reliable list of producers of road materials or statistics of production. This fact is evidenced by a statement recently made in an address by the president of this Association, who stated that the Association itself did not know by several hundred how many sand and gravel producers there are in the United States.

Last winter, therefore, following a hearing given the sand and gravel and other road-building interests, at which the former were ably represented by your business manager, Mr. Sutton—it was ordered by Mr. MacDonald, Chief of the Bureau of Public Roads, that a survey of sand and gravel producing plants be at once inaugurated, and that the study of broken stone production, already under way, be continued. This work having been placed in charge of the writer progressed, so far as sand and gravel is concerned, as follows:

All available lists of producers were secured, correspondence was entered into with state highway departments, geological surveys, mining bureaus, and various educational institutions. Questionnaires were sent out to producers and follow-up letters were mailed, with the result that about 20 per cent of them all were returned, undeliverable, and less than 50 per cent of those who evidently received the appeals for information made reply. It was then decided to organize field parties and to obtain our information through a canvas by states, by men who would also gather all the information possible on the occurrence and distribution of road materials, as well as plants, thus making a preliminary and very general survey of materials.

As the season of 1920 opened, field work was begun in the northern states, and continued satisfactorily up to the end of the year—although retarded somewhat by the illness and withdrawal of one of the field men.

Work in the following states has been completed: Maine, New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Kentucky, and South Dakota.

Work in the States of Delaware, Maryland, West Virginia, and Virginia has been partially completed. It is expected to complete this survey for the entire eastern part of the United States, that is, everything east of the Rockies, this winter and early spring.

The objects of the sand and gravel survey were as follows:

1. To obtain a correct list of producers with both the location of the plant and office address.

2. To eliminate "dead" plants from our list and those listed as producers who are dealers only.

3. To note as far as possible in a preliminary way the distribution of sand and gravel deposits and of locally worked pits, but to confine the survey essentially to the so-called permanent plants, equipped for screening and washing. Plants producing sands for special purposes, such as for foundry uses, glass manufacture, etc., omitted.

4. To photograph plants and sand and gravel pit faces.

5. To send samples of sand to the testing laboratory of the Bureau for mechanical analysis.

6. To determine by a field inspection the quality of material and the pit run as regards relative quantities of sand and gravel, respectively.

7. To note the nature of the deposit from a geological standpoint.

United States Bureau of Public Roads Summary of Sand and Gravel Survey Results in Sixteen North Central and Northeastern States

STATE	Total	Wet	Dry	Both	Daily Capacity Tons	1919 Tonnage	1920 Estimated Tonnage	Tons Used on Roads	CAR SHORTAGE 1919 No. Affected	1919 Per Cent Reduced	1920 No. Affected	1920 Per Cent Reduced
Maine	3		3		900	57,000	77,000	9,200	0		1	50
New Hampshire	1		1		210	30,000	35,000	5,250	0		1	15
Massachusetts	12	1	11		9,885	674,000	968,000	147,600	0		3	20 to 70
Connecticut	10	2	8		2,750	326,000	360,500	69,850	0		1	90
New York	26	6	20		28,615	2,867,600	3,469,700	846,850	5	25 to 60	9	15 to 75
New Jersey	25	5	18	2	26,425	1,967,000	2,352,000	956,850	15	5 to 75	15	5 to 75
Pennsylvania	50	18	32		50,200	4,936,000	5,633,200	1,229,650	19	10 to 50	26	10 to 75
Ohio	78	33	43	2	71,120	4,287,150	5,369,500	1,818,125	36	5 to 80	40	10 to 90
Indiana	63	33	30		59,825	4,380,400	4,225,500	1,687,800	29	10 to 95	33	15 to 95
Illinois	51	22	27	2	79,225	5,467,800	5,425,000	2,944,000	35	6 to 85	38	20 to 90
Michigan	51	20	31		59,415	4,320,085	4,847,000	1,403,565	32	10 to 75	39	10 to 90
Wisconsin	35	3	32		33,750	1,979,942	3,211,000	883,700	17	10 to 60	18	25 to 90
Minnesota	32	6	26		20,835	838,964	1,676,000	497,700	8	30 to 70	11	40 to 90
Iowa	71	42	29		57,540	2,055,873	2,661,000	642,000	38	10 to 80	49	20 to 85
Kentucky	12	10	2		14,040	877,750	1,089,750	180,800	6	25 to 50	5	20 to 60
South Dakota	3		3		2,400	Started 1920	78,000	25,000	0		0	
Grand Total	523	201	316	6	517,135	35,065,564	41,478,150	13,347,940	240	5 to 95	289	5 to 95

In the statistics above, small, locally used sand and gravel pits are not included. These, however, are abundant in some of the Northern States.

*Paper read at the convention of the National Association of Sand and Gravel Producers at Louisville, Ky., 1921.

8. To note the quantity of stripping, thickness of deposit, thickness worked, kind and character of the material, the uses to which the product is put, the ton production for 1919 and 1920 for both gravel and sand, the percentage of annual product which goes into roads.

9. To note the capacity of the plant, number of days per year operated, the number of days per average year that operation is possible.

10. To obtain data on methods of operation, together with description of plant.

Finally, to learn in detail the extent to which the industry was affected by car shortage.

While we have just now begun to digest the information at present obtained, a summary of the more important items has been completed for 16 states. A copy of this is given herewith. In these 16 states, we have located a total of 523 producing sand and gravel plants; of these, 201 operated by the wet method, 316 by dry method, and 6 by both. The total daily capacity of these plants is 517,135; the total production for 1919 in tons was 35,065,564. The estimated tonnage for 1920 was found to be 41,478,150; the tons of material used on roads was 13,347,940; 240 plants reported business impaired by car shortage—the effect varying from 5 per cent to 95 per cent loss of business, due to this cause.

A matter lying outside the province of this survey, which may, however, be of interest to the members of this Association, is the question of cost data. The writer has found by wide observation that comparatively few producers of either broken stone or sand and gravel have any adequate system of keeping cost accounts. A few years ago, the writer, while studying broken stone production, devised a plan for keeping actual production costs in both terms of labor and money, and by units of operation, for that industry. This system has been tried at a considerable number of quarries and has been found practical, useful, simple and inexpensive. It is suggested that something along similar lines might be worked out to apply to your industry. It would certainly be profitable to have a production (only) cost account kept for a group each of the various types of plant.

This occasion is taken to express our gratitude to the sand and gravel producers and the officers of this Association for the cordial co-operation which has been given us in our work, almost without exception. Once it became clear that we were neither tax inquisitors nor prohibition agents, we were heartily welcomed and cheerfully assisted in the work.

States Bring Pressure for Lower Freight Rates on Highway Material

PRODUCERS OF sand, gravel, crushed stone and slag, who are more or less in close touch with state officials, say that the favorable attitude railway executives are taking toward voluntary reductions of excessive rates on these low-priced commodities is in no small measure due to the pressure being brought to bear by various state governments.

As noted in past issues of ROCK PRODUCTS the State Highway Department of Michigan has already told the railways in that state that it will use all the authority and influence of the state government to bring about a reduction in freight rates on sand, gravel, crushed stone and slag used in state and county road building. The New York State Highway Department has been influential in keeping the increased rates from becoming effective up to this time, and is trying to arrive at a fair schedule of rates for the 1921 season. Ohio may also take similar action.

Missouri seems to have been the first state to take action. The order of the Missouri Public Service Commission issued last fall was as follows:

IT APPEARING that prior to the assumption of control of the railroads by the United States Government there was in effect a provision requiring said carriers to transport road-making material, such as gravel, sand, crushed stone and broken rock, chats and like articles, at a rate of 6 mills per ton per mile, and

IT FURTHER APPEARING that tariffs of some of the carriers operating in the State of Missouri show that this rate was canceled on the last day of Federal control, to-wit, February 29, 1920, and

IT FURTHER APPEARING that road-making materials such as above specified move in large quantities and in regular shipments and are of that class of freight traffic which justifies the lowest classification, and the commission being of the opinion that such rates should not be canceled without an investigation, the reservation in case 2492 approving the rates made by the Director General as in effect February 29, 1920, should be exercised in this instance, and an investigation of the increase made by the Director General upon these commodities should be had. It is therefore

ORDERED: 1. That all carriers, parties to Case 2492, be and they are hereby required to show cause why the rates applicable upon crushed and broken rock, sand, gravel, chats and like commodities when consigned to an official of the national, state, county or municipal government and when intended for road-making purposes should not be charged a rate of 6 mills per ton per mile plus such reasonable advance thereon as may be justified.

This is given verbatim because it may be useful to producers in other states as an "argument" to use with their local railway men.

New Use for Blast Sand—Wood Carving

A CALIFORNIA CONCERN has developed a process of carving wood by a special sand-blast process. Redwood has been found to give the best results in this process on account of the character of the grain and the quality of the wood. The distinctive quality of the work promises to commend itself strongly to architects and designers.

This etching method produces very rich effects if used in paneling the walls of a dining-room, hall or den. It is equally well suited to ceiling decoration. In the case of this ornamental nook the walls show three large panels with plain backgrounds, in the center of which are conventionalized classic figures. The plain background is produced by allowing the sand to eat away the surface uniformly. The figures are the portions of the wood surface protected by the stencil.

While much of this work is done in the natural color of the rich, reddish brown redwood, striking color effects can be used. The makers use paints with great success in carrying out various decorative schemes. Deep blues, reds, browns and gilt are particularly pleasing.

In addition to the uses for this carved wood suggested above it is excellent for folding screens, grills and inside blinds.—"National Builder."

Glass Sand Production in the United States

ACCORDING to recent figures, a little less than 2,000,000 tons of glass sand was used in the United States in 1919, according to recently compiled statistics of the United States Geological Survey. Most of this came from New Jersey, Pennsylvania, West Virginia, Ohio, Illinois and Missouri. Most silica deposits suitable for glass sand also produce a variety of other sands.

Grinding, polishing, and blast sands are used to make smooth the rough places on metal, glass, stone and other hard substances. Blast sand is clean, tough, sized sand, composed of either round or angular grains, which is driven by compressed air through a hose for such purposes as cleaning metal castings and dressing stone. In gun shops, locomotive and car shops, and most other places where heavy metal castings are made, the sand blast is used to clean off parts of the mold that adhere to the castings. The size of sand used differs according to the character of the duty it is to perform.

Fire or furnace sand is highly refractory silica sand for lining furnaces and ladles used to contain molten metal, and so has a place in all foundries. About 500,000 tons of this sand is used annually in the United States.

Crushed Stone Producers Meeting

National Crushed Stone Association Becomes a Real International Organization—Plans Aggressive Campaign for Membership—Defends Policy

SOME QUESTIONS AND PROBLEMS of vital importance to the crushed-stone quarry industry of America were intimately discussed at the Toronto meeting of the National Crushed Stone Association, Feb. 7, 8 and 9. There was no expression of sentiment in favor of "amalgamating" with the sand, gravel and slag interests; and the action of the executive committee in declining to change the date and place of the annual convention to conform with the suggestion of the United Mineral Aggregate Committee was unanimously approved.

F. W. Schmidt, of the Morris County Crushed Stone Co., Morristown, N. J., said he believed each industry should maintain its identity but should arrange to meet annually at the same time and place, so as to be able to co-operate on common problems. W. L. Sporborg, of the Rock-Cut Stone Co., Syracuse, N. Y., said that he could see nothing in common to the two industries except transportation problems. (Both Messrs. Schmidt and Sporborg, as crushed stone producers, have been in close co-operation with sand and gravel operators in western New York State in the presentation of a freight rate case.) G. P. Longwell, of the Consumers Co., Chicago, Ill., representing subsidiaries of that corporation producing both sand, gravel and crushed stone, said that Illinois conditions were peculiar in that commercial crushed stone was largely used as concrete aggregate.

Freight Rates a Local Issue

A report of the traffic committee of the association, of which P. C. Hodges, of the Marble Cliff Quarries Co., Columbus, Ohio, is chairman, was read by the secretary. This report stated that the crushed-stone men had reliable information that both the open-top car and the freight-rate hearings given the industry by the Interstate Commerce Commission were perfunctory so far as they were concerned, that the course of action had been determined upon by the commission and would have been carried out no matter what kind of a case the stone and gravel industries had presented. Consequently the executive committee of the National Crushed Stone Association had deemed it unwise to spend a large sum of money fighting what was deemed, and subsequently proved to be, a hopeless case.

Regarding an adequate car supply in 1921, the report stated there was not much cause for optimism. Mr. Hodges thought there was a very good chance that the Interstate Commerce Commission would again be compelled to take charge of the situation, if business picks up, as everyone seems to think it will. This, Mr. Hodges said, was the view of many railway officials. The approaching labor troubles of the railways seem to make this more than likely. Mr. Hodges said the coal industry would very possibly try to repeat its scoop of last year and said some action must be taken to defend the stone industry's right to a fair share of open-top railway equipment.

A letter to Secretary Sandles from his friend, Senator Pomerene of Ohio, was read by Mr. Sandles. The senator is in favor of revising the Esch-Cummins Act to eliminate features objectionable to the stone industry and stated that this matter is now in the hands of Senator Calder's committee. There is not, however, any prospect of immediate action by Congress, and there probably will be no action by this Congress.

Regarding a revision of freight rates downward, the report of the traffic committee stated that this was likely to come in the near future from the railways, which are already beginning to recognize the needs of their shippers. A letter from the traffic manager of the Columbia Quarry Co., St. Louis, Mo., was read, urging that quarry operators prepare a questionnaire to be sent out to the trade (users of crushed stone). The answers to this questionnaire would prove to the railways how high freight rates are actually reducing their revenue by opening up of many small local operations.

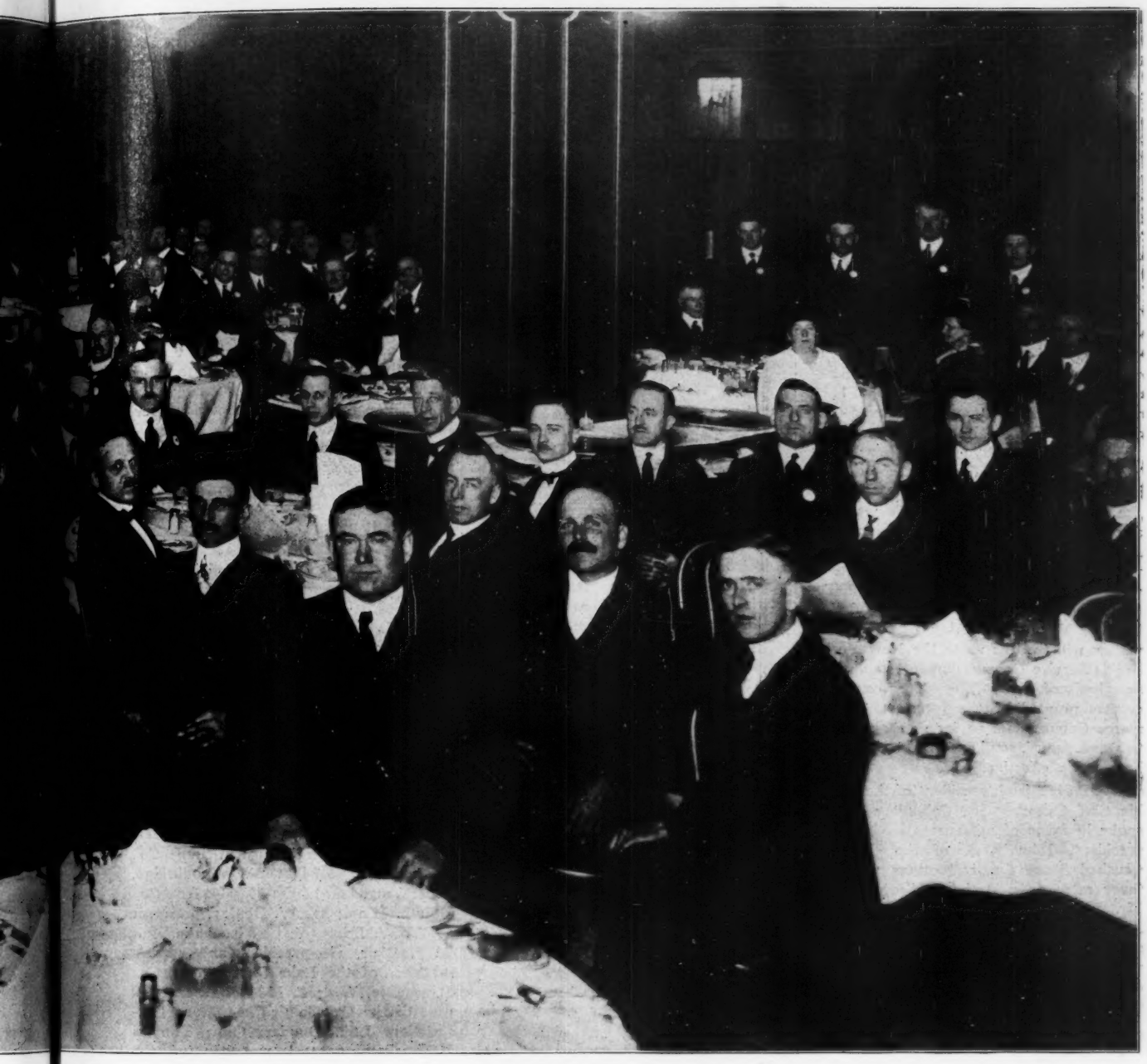
H. E. Bair, of the France Stone Co., Toledo, Ohio, stated that his company, in co-operation with other shippers in Ohio, had already made considerable progress with the railways by proving to them that large contracts which legitimate producers should get were going to local or temporary plants from which the railways derived no income whatsoever. All speakers agreed that there should be no real antagonism between the crushed-stone industry and the railways. The two are so related that there is every expectation of reaching a fair settlement.

In Canada, on the other hand, the crushed-stone industry was successful in staving off the 40 per cent increase applied on all other commodities (except sand, gravel and slag) by making a fight before the Dominion Railway Commis-

E. J. Krause John Rice J. F. M. Stewart A. P. Sandles

List of Crushed Stone Producers Registered at the National Crushed Stone

Allen, H. B.—General Crushed Stone Co., Philadelphia, Pa.
Babcock, B. R.—Callanan Road Improvement Co., Albany, N. Y.
Bair, H. E.—France Stone Co., Toledo, Ohio.
Balfe, Geo. H.—Monon Crushed Stone Co., Monon, Ind.
Bennett, A. G.—Laurin & Leitch, Montreal.
Bennett, Leslie J.—Buffalo Cement Co., Buffalo, N. Y.
Bonnell, L. C.—Commonwealth Quarry Co., Summit, N. J.
Borns, Daniel—Thomas Quarry Co., St. Mary's, Ontario, Canada.
Boyle, Robin—Standard Crushed Stone Co., Niagara Falls, Ontario, Canada.
Brittell, Wm.—Brittell & Co., North Toronto, Ontario, Canada.
Clark, Claude L.—National Crushed Stone Association, Columbus, Ohio.
Cumning, F. C.—Van Camp Stone Co., Cincinnati, Ohio.
Dixon, Thornton—Monroe, Mich.
Doolittle, C. M.—Canada Crushed Stone Co., Dundas, Ontario, Canada.
England, C. F.—Toronto, Ontario, Canada.
Essery, G. W.—Crushed Stone, Ltd., Arcade, Toronto, Ontario, Canada.
Evans, (Mrs.) Herman H.—Monon Crushed Stone Co., La Fayette, Ind.
Fleming, Thos.—Federal Stone & Supply Co., Ottawa, Ontario, Canada.
Foley, Daniel—Federal Stone Co., Chicago, Ill.
Foote, W. E.—Wickwire-Spencer Steel Co., Gasport, N. Y.
Freiberg, Chas. A.—Buffalo Cement Co., Ltd., Buffalo, N. Y.
Gordon, Robt. D.—Crushed Stone, Ltd., Arcade, Toronto, Ontario, Canada.
Graham, J. W.—Thomas Quarry Co., St. Mary's, Ontario, Canada.
Graves, Otho M.—General Crushed Stone Co., Easton, Pa.
Gray, D. M.—Louisville Cement Co., Louisville, Ky.
Gucker, F. T.—John T. Dyer Quarry Co., Philadelphia, Pa.
Hambleton, Robt. — Hagersville Crushed Stone Co., Hagersville, Ontario, Canada.
Harrigan, J. J.—France Stone Co., Toledo, Ohio.
Hart, J. B.—Canada Crushed Stone Co., Ltd., Dundas ,Ontario, Canada.
Hawblitz, L. H.—France Stone Co., Toledo, Ohio.
Heimlick, J. L.—Le Roy Lime & Crushed Stone Co., Le Roy, N. Y.
Higgins, C. V.—Bound Brook Crushed Stone Co., Bound Brook, N. J.
Hoagland, W. H.—Marble Cliff Quarries Co., Columbus, Ohio.
Johnson, R. W.—Johnson, Van Wagner & Johnson, Tontogany, Ohio.
Keever, W. J.—Marble Cliff Quarries Co., Columbus, Ohio.
Krause, E. J.—Columbia Quarry Co., St. Louis, Mo.
Lavenberg, Joe O.—France Stone Co., Toledo, O.
Laurin, James—Montreal Crushed Stone Co., Ltd., Montreal, Canada.



al Cru d Stone Convention, Toronto, Canada, February 7, 8 and 9, 1921

Leitch, W. C.—Montreal Crushed Stone Co., Ltd., Montreal, Canada.
Longwell, G. P.—United States Crushed Stone Co., Chicago, Ill.
Lowrey, R. J.—Queenston Quarry Co., St. David's, Ontario, Canada.
McLean, Ralph E.—East St. Louis Stone Co., East St. Louis, Ill.
Mann, E. E.—France Stone Co., Toledo, Ohio.
Moscrip, Andrew L.—France Stone Co., Toledo, Ohio.
Owens, I. G.—Water Street Trap Rock Co. Water Street, Pa.
Paul, E. T.—Bluffton-Lewisburg Stone Co., Lewisburg, Ohio.
Porter, J. M.—General Crushed Stone Co., Easton, Pa.
Rice, John—General Crushed Stone Co., Easton, Pa.
Riggs, C. P.—Columbia Quarry Co., St. Louis, Mo.
Robinson, W. D.—Toledo Stone & Glass Sand Co., Toledo, Ohio.
Rogers, Frank—Oliver Rogers Stone Co., Toronto, Ontario, Canada.
Rogers, Frank, Jr.—Oliver Rogers Stone Co., Toronto, Ontario, Canada.
Sandles, A. P.—Secretary of the National Crushed stone Association, 405 Hartman Bldg., Columbus, Ohio.
Savage, James—Buffalo Crushed Stone Co., Buffalo, N. Y.
Schaefer, G. E.—General Crushed Stone Co., Rochester, N. Y.
Schmidt, F. W.—North Jersey Quarry Co., Morristown, N. J.
Schmidt, F. W., Jr. — Morris County Crushed Stone Co., Morristown, N. J.
Schoendman, F. W. — Wentworth Quarry Co., Vinemont, Hamilton, Ontario, Canada.
Seitz, A. G.—Rock-Cut Stone Co., Syracuse, N. Y.
Shaw, W. R.—Provincial Stone & Supply Co., Toronto, Ontario, Canada.
Sporborg, W. L.—Rock-Cut Stone Co., Syracuse, N. Y.
Stafford, Charles—Toledo Stone & Glass Sand Co., Toledo, Ohio.
Stewart, J. F. M.—Point Anne Quarries, Ltd., Toronto, Ontario, Canada.
Stinebaugh, I. L.—France Stone Co., Toledo, O.
Stolle, F. W.—Casper-Stolle Quarry & Construction Co., East St. Louis, Ill.
Sullivan, A. J.—Inland Crushed Stone Co., Chicago, Ill.
Sullivan, J. J.—Dolese & Shepard, Chicago, Ill.
Thompson, Fred W.—Point Anne Quarries, Ltd., Toronto, Ontario, Canada.
Tyler, R. B.—R. B. Tyler Stone Co., Louisville, Ky.
Urschel, J. J.—Woodville Lime Products Co., Toledo, Ohio.
Van Camp, B. T.—Van Camp Stone Co., Cincinnati, Ohio.
Wagner, C. R.—National Agricultural Limestone Association, Columbus, Ohio.
Woodward, Donald—Le Roy Lime & Crushed Stone Co., Le Roy, N. Y.
Worthen, A. L.—Connecticut Quarries Co., New Haven, Conn.
Yambert, D. W.—France Stone Co., Toledo, Ohio.

sion, which corresponds to our Interstate Commerce Commission. J. F. M. Stewart, president of the Provincial Stone & Supply Co., Ltd., Toronto, and Robin Boyle, of the Standard Crushed Stone Co., Niagara Falls, Ont., gave the history of the Canadian rate case. This was won on the ground that ton-mile and car-mile earnings on the total tonnage actually shipped by the Canadian producers in the year 1919 before the contemplated increases were much more the ton-mile and car-mile earnings on other commodities after the 40 per cent increases.

The Canadian case was strengthened by provincial and county highway officials, whose testimony that they would cease buying commercial stone and open up local quarries and pits made considerable impression on the commission. The railways did not attempt to answer the arguments advanced by the stone men.

W. L. Sporborg told of the New York State case. He said they were co-operating in the presentation of this case with the sand, gravel and slag producers and also with the State Highway Department. Mr. Sporborg said they had tried to work with the railways and had failed to get any encouragement from them. The final hearing on this case will be held in Albany, N. Y., on Wednesday, Feb. 16. The matter will then be up to the New York Public Service Commission to establish a new basis of rates. The 40 per cent increases granted by the Interstate Commerce Commission, so far as they apply to stone, gravel, sand and slag, have never been made effective.

W. H. Hoagland, president of the Marble Cliff Quarries Co., Columbus, Ohio, spoke in favor of mileage rates, but the president, John Rice, of the General Crushed Stone Co., and others did not favor rates on a straight mileage basis. Mr. Rice said the rates should be the lowest that the railways could afford and should get the benefit of any empty car movements in one direction. The final decision was that freight rates are entirely a local and not a national issue.

Cost of Production—Labor Situation

A very interesting discussion of the cost of producing crushed stone in various sections of the country resulted from a tabulation of 1919 costs made by President Rice. About the only conclusion to be drawn was that unit costs of the seven items varied by as much as 300 per cent, showing either that quarry operating costs vary tremendously or a great many operators do not know their actual costs.

The total costs of producing crushed stone were in some cases as much as 200 per cent apart. These differences were explained, however, by the policy of some operators to charge off big items like stripping, large repairs, etc., to the season's operating cost, while other operators distribute such expenses over several years' operation. Also it was generally admitted that the actual cost of operating different quarries did vary tremendously.

E. J. Krause, President

A discussion of labor conditions made it plain that the majority of quarry operators have already cut the wages of common labor from around 10 to 30 per cent. A cut of 20 per cent seemed to be about the average. In some cases steam-shovel runners and other skilled and organized employees have also been cut, but generally not so much. There seems to be a general increase in efficiency of labor.

The chief point brought out in this discussion was that every effort should be made at this time to get on a man-to-man basis with all employees, to present the issue to them squarely, and to gain their confidence. The General Crushed Stone Co. has had some very interesting and valuable experience along these lines, which was related by Otho M. Graves. This company has a profit-sharing scheme, which was explained in detail in a previous issue of Rock Products,

R. Brink Tyler, Vice-President

The prevailing wage of unskilled labor in quarries at this time was shown to be from 35 to 50 cents per hour. The point was made by J. J. Urschel, of the Woodville Lime Products Co., Toledo, Ohio, that wages must be reduced now if they are going to be at all this season. He told of the policy of his company in building houses for all of its employees and renting them at cost. Others told of similar enterprises.

The general belief was expressed that there is a strong possibility that while wages for common labor are down temporarily, they may be expected to rise again if a real building boom starts. Consequently one must approach the subject of prices for 1921 with that thought in mind. An analysis of costs in 1919 showed that no one of the seven fundamental items of cost was likely to be more than 20 per cent less. This item was labor, which amounts to only 32 per cent of the final selling price.

Officers Elected

E. J. Krause, vice-president and general manager of the Columbia Quarry Co., St. Louis, Mo., was elected president for 1921. Mr. Krause is interested in all phases of the crushed-stone industry and is one of the most prominent business men of St. Louis in many other lines of activity. W. Scott Eames, general manager of the New Haven Trap Rock Co., New Haven, Conn., was elected first vice-president, and R. Brink Tyler, president of the R. B. Tyler Stone Co., Louisville, Ky., was elected second vice-president. Directors at large were elected as follows: John Rice, president of the General Crushed Stone Co., Easton, Pa.; Dwight E. Woodbridge, general manager of the Mesaba Iron Co., Duluth, Minn.; W. W. Boxley, president of W. W. Boxley & Co., Roanoke, Va.; A. J. Blair, vice-president and general manager of the Lake Shore Stone Co., Milwaukee, Wis.; C. M. Doolittle, president of the Canada Crushed Stone Corporation, Ltd., Dundas, Ont.; Thomas McCroskey, general manager of the American Limestone Co., Knoxville, Tenn., and A. Acton Hall, president of the Ohio Marble Co., Piqua, Ohio.

A whole-hearted vote of thanks was given our Canadian crushed-stone "brothers," being "cousins" no longer. A royal welcome and entertainment was provided, and the annual banquet was graced with the presence of some of the Dominion's most prominent public men.

Plan Aggressive Campaign

It was voted to increase the yearly dues to a maximum of 15 cents per hundred tons and to provide at once for the services of an assistant secretary and organizer to specialize on increasing the membership through district organizations.

Plaster Investigations of the U. S. Bureau of Standards

Progress on Work of Great Importance to Lime and Gypsum Industries

WASHINGTON, D. C.—Considerable progress toward the development of standard specifications for lime and gypsum plaster was made during the year 1920 by the Bureau of Standards. In the annual report of the director, which has just been submitted to Secretary of Commerce Alexander, the work done along this line is discussed in some detail.

Popping of Lime Plaster

Unless lime which is used for plastering purposes is properly made and handled it is apt to pop. Small particles will hydrate after the plaster is set, will expand, and push themselves out of the wall, leaving small holes in the plaster. It is obviously essential that a test for this tendency to pop, or unsoundness, be included in the standard specifications for lime. Before such a test could be established as satisfactory it was deemed necessary to investigate the causes of the phenomenon.

Accordingly, a research on this subject has been conducted by the manufacture of plasters containing known amounts of suspected ingredients. These plasters were exposed to the air for a year and examined for signs of popping.

As a result, it may be stated that popping is caused by particles of chemical compounds which are formed by the union of certain impurities with the lime in the kiln. These compounds can be distinguished from lime by their appearance, and can therefore be sorted out. Small particles which escape the sorter can be taken care of by soaking the lime overnight before using. If the particles are all fine enough to pass a No. 48 sieve, and there are not too many of them, they may pop without leaving holes large enough to cause disfiguration of the wall.

Chemical Lime

More than half of all the lime produced is sold as chemical lime; that is, it is used as a reagent in the manufacture of other materials. Heretofore it has been customary for each purchaser of chemical lime to prepare his own specifications. This has led to great confusion in the industry. A certain quality of lime may be rejected by one purchaser as failing to pass his specifications and accepted by another purchaser using more lenient specifications, even though both parties are buying the lime for exactly the same purpose.

The Bureau has invited representatives of various other Government bureaus to meet with it and to draft recommended specifications for the various kinds of lime required by the chemical industries. Before publication of these specifications, they will be approved by the National Lime Association and by the corresponding national association of the users.

Measurement of Plasticity

Finishing hydrate, which is used for the third or white coat of plaster, sells for about $2 a ton more than other kinds of hydrated lime. It differs from other kinds solely by reason of its greater plasticity. Plasticity is therefore a property having great economical importance, and a requirement for it must be included in the specifications for finishing hydrate.

A method of measuring the plasticity of lime has been developed by the Bureau. A description of the machine used is given in Technologic Paper No. 169. The Bureau now collecting numerical data so that fair limits may be established for the plasticity of finishing hydrate.

The Acoustics of Wall Plasters

The question of acoustics, especially of public auditoriums and of apartment houses, is becoming a very serious and important one. It is generally conceded that much of the trouble caused by the reflection and reverberation of sound is due to the design of the room, but it is also suspected that the character of the walls may have something to do with it.

To investigate this point, the Bureau has undertaken to measure the quantity of sound transmitted, reflected, and absorbed, by all of the usual types of wall construction. Twenty-one panels, each 4 feet square have been prepared. These represent all usual types of backing, such as different kinds of masonry and of lath; different types of plaster such as lime and gypsum; different types of finish, such as smooth troweled and sand floated; and different types of after treatment such as papering and painting. No tests of their acoustical properties have yet been made.

Colored Plaster

From the viewpoint of both the architect and the owner, the usual dead white color of a wall plaster is not satisfactory. Several attempts have been made to produce tinted plaster by the addition of some pigment to the plastering material. These have not been successful because it is almost impossible to match the tints of different batches and the line of demarcation between work done at different times is therefore glaringly pronounced, and also because plaster colored in this way is still dead—the texture is displeasing.

The bureau has produced an unlimited variety of colors and textures by the use of gypsum wood-fibered plaster. The wood fiber is dyed the desired colors before being mixed with the gypsum. By scrubbing the surface of the plaster after it has set, these fibers can be made to stand out from the wall more or less distinctly, thereby producing both color and texture.

A report on this subject is now in course of preparation.

Conference on Plastering

In most city building codes the specifications for wall plaster are either very lax or entirely missing. To remedy this defect the bureau has organized a conference for the specific purpose of writing a National Plastering Code. It is hoped that this work will be of such quality that it will be accepted as a guide by the city legislators when they frame their own laws on this subject. The conference is composed of official representatives of the Portland Cement Association, the National Lime Association, the Gypsum Industries Association, the National Association of Sand and Gravel Producers, the National Brick Manufacturers Association, the Hollow Building Tile Association, the National Lumber Manufacturers Association, the Associated Metal Lath Manufacturers, the National Association of Plastering Contractors, the International Plasterers' Union, the American Institute of Architects, the National Fire Protective Association, and the Supervising Architects Office of the Treasury Department.

The work is well under way. The first chapter, having to do with the preparation of masonry surfaces to receive plas-

ter, is about ready for the final action of the conference.

Physical Tests of Gypsum

Certain methods of test for gypsum have been adopted as tentative standards by the American Society for Testing Materials. In order to write specifications for gypsum, it is necessary to know the numerical limits for the different properties, as measured by these standard methods. To obtain this necessary numerical data, the bureau has measured the chemical composition, fineness, normal consistency, time of set, compressive strength, tensile strength, and yield of 43 samples of commercial gypsum products.

Cracking of Gypsum-Block Partitions

Gypsum block is a comparatively new building material. In accordance with the usual custom, therefore, any failure of a partition built of gypsum block is immediately blamed on the block without further investigation. If the block does really cause cracking, the public should be warned; if it does not, the block manufacturer should have definite facts to combat the calumny.

The expansion and contraction of individual blocks when wet and dry, hot and cold, loaded and not loaded, have been measured. A partition 22 ft. long by 10 ft. high by 3 in. thick has been built of gypsum blocks. Careful measurements of this partition and of the concrete beams above and below it are being taken at frequent intervals, so that if the partition does crack we shall have sufficient data to tell why.

Co-operation with the American Society for Testing Materials

The work of the American Society for Testing Materials is chiefly the preparation of specifications for materials, through special committees appointed to handle the individual subjects.

This section holds membership in committee C-3, on brick. It holds membership in committee C-7, on lime, and the chairmanship of subcommittee 2 on structural lime and subcommittee 6 on plasticity. It holds the chairmanship of committee C-11, on gypsum.

All of these committees meet frequently and the bureau is called upon to develop test data for their use.

Visits to Lime and Gypsum Manufacturing Plants

In order to keep in close touch with the new developments in the industry, and to obtain a first-hand knowledge of the problems confronting it, the practice has been started of making personal visits of inspection to the manufacturing plants. During the past year 28 lime plants and one sand lime brick plant in Maryland, Virginia and the District of Columbia have been inspected. Complete descriptions of the plants, illustrated with photographs, are kept on file for future reference.

Gypsum as a Fertilizer

Kentucky Agricultural Expert Says New Knowledge of the Sulphur Requirement of Soils Should Reopen Whole Subject of Fertilizer Theory and Practice

THE COMING DEVELOPMENT of gypsum deposits for the agricultural value of this material in pulverized form seems assured, on scale probably second only to the agricultural lime development. Gypsum is so widely distributed in this country that sources of supply are easily accessible to all our farming sections.

Regarding the importance of the sulphur element of gypsum as a fertilizer Charles A. Shull, of the University of Kentucky, has this to say:

"Information concerning the relation of sulphur to plant nutrition and growth has been accumulating during the last decade, and the mass of data has now become so important that it demands recognition of all investigators of nutritional problems.

"Although the value of sulphur, *particularly in the form of gypsum,* was recognized at an early period in our national history, the lack of uniform success with it soon led to its neglect as an important fertilizer. And after the invention of acid phosphate about the middle of the last century, the development was almost wholly toward soluble fertilizers containing nitrogen, phosphorus and potassium. Sulphur was not included as a part of a complete fertilizer, although it was recognized as necessary to plant growth. The soil was thought to contain enough sulphur, and plants to need so little of it, that it was added to the soil only incidentally, as in acid phosphate, potassium sulphate, or ammonium sulphate, along with the three elements forming the so-called 'complete' fertilizer.

"Soil studies have shown that sulphur is one of the rare necessary elements. Soils are generally no richer in sulphur than in the fertilizer elements, nitrogen, phosphorus and potassium. This scarcity of sulphur in normal soils is probably related to the ready leaching of sulphur into drainage water. At the same time improved analytical methods have demonstrated that crop plants require more sulphur than was formerly supposed. They remove it from the soil fully as rapidly as they remove any of the other elements which may become limiting factors. The normal sulphur content of soils is sufficient for from 15 to 70 crops, provided there are no additions from outside sources, as from rainfall. The important point is this: If sulphur is a limiting factor, addition of any other fertilizer is useless, and a waste, just as much as would be the use of gypsum as a fertilizer if phosphorus were the limiting factor.

"Since certain crops are known to use quantities of sulphur, plants of these families must be the ones most likely to suffer from deficiency of sulphur. Recent work by Reimer at the Oregon Agricultural Experiment Station is very significant and deserves the attention of agriculturists and scientists all over the country. His experiments extended over several years, and involved a variety of soils. The increased production ran from 50 to 1000 per cent in alfalfa, with application of such sulphur-containing materials. Addition of phosphorus without sulphur had practically no effect, showing that the acid phosphate was valuable only for its sulphur content in this case.

"The best results seem to come when the sulphur is used as a top dressing on the legume crop. The usual custom in the United States is to fertilize the cereals, wheat, etc., and allow the legumes to get the effects a year or two later. Sulphur applied in this way does the legume crop little good, for most of it disappears out of the soil by leaching before the legume comes in the rotation. The early successes were most notable when application of the sulphur fertilizer was made directly to the crops most needing it, the legumes. These convert the sulphur into the organic form, and if used as green or stable manures provide sulphur for succeeding crops in a non-leaching form. It seems quite clear that we are applying our sulphur fertilizers at the wrong place in the rotation when we use them with the cereal grains which require little sulphur. Top dressing in legumes would be the logical time in the rotation to provide the sulphur when it is known to be deficient in amount.

"We know enough now to make our tests crucial as to which element or elements limit production. The only way we can know the facts will be by actual tests. The system of soil fertility upon which our vast expenditure for fertilizers is based should be examined and tested with open unprejudiced minds. The tests of sulphur containing fertilizers should be made over wide areas in the Eastern United States, for there must be many soils in which sulphur is deficient."

Standardization of Molding Sands*

Suggestions for Classifying and Establishing Relative Values—Apparatus and Methods for Testing—Characteristics of Typical Sands

By C. Powell Karr, Ph.B.

THE PROPERTIES OF MOLDING SAND considered as typical are what may be required of a brass, an iron and a steel molding sand in general use. The finer distinctions that are in vogue and practice in each division of the above sands for special purposes are too numerous and complex to come within the scope of these suggestions.

Molding sands are so varied in appearance, character, uses and physical properties that it has been thought best to confine the range of this article to typical molding sands according to their various uses as suggested above. The statement of facts herein presented will, it is to be hoped, form the basis of future work.

Molding Sand Defined

The best definition yet published of a molding sand is the one stated by Dr. Richard Moldenke in his work on the Principles of Iron Founding, page 279 (1917), in which he says that an ideal molding sand is a sand consisting of uniform-sized rounded grains of silica, each grain evenly coated with the thinnest necessary layer of the most refractory and fattest clay to be had.

This definition indicates a material advance in the generally accepted conception of a molding sand; it points the way of going further, and leads up to the distinctive tests a sand must undergo before it could be accepted as a satisfactory molding sand. Naturally it leads up to such practical and desirable tests as the melting point, shearing and transverse or tensile stress tests, sieve tests and other desirable information. A sand must be submitted to all of these tests before the molder can form a reliable judgment of its value.

On page 270 of the same work, quoted above, Dr. Moldenke states that 2750 deg. Fahr. or 1510 deg. C. is taken as the point below which no first-class refractory should soften. As he probably refers to a molding sand suitable for cast iron he is no doubt right, but if applied to a molding sand for brass castings, the figure is too high, and if for steel castings, it is too low. For brass castings it is believed that the safe figure should be not less than 1350 deg. C., and for steel castings not less than 1580 deg. C., in round numbers.

In what ensues, the general classification first outlined will be followed as closely as possible. The greatest use to the greatest number will be subserved in confining these suggestions for basic comparison to the usages to which a molding sand will be put, rather than to open them to a wider classification by the tests to which they must be submitted.

In general it would be useful to a foundryman to have some well-known, typical sand cited as a basis for comparison. If any other sand he may wish to use is superior to the one named, then the value of such a sand may be expressed in a percentage rating of the one to which it is compared; the same conclusion applies

*Reprinted by permission from "Iron Age," Sept. 30, 1920.

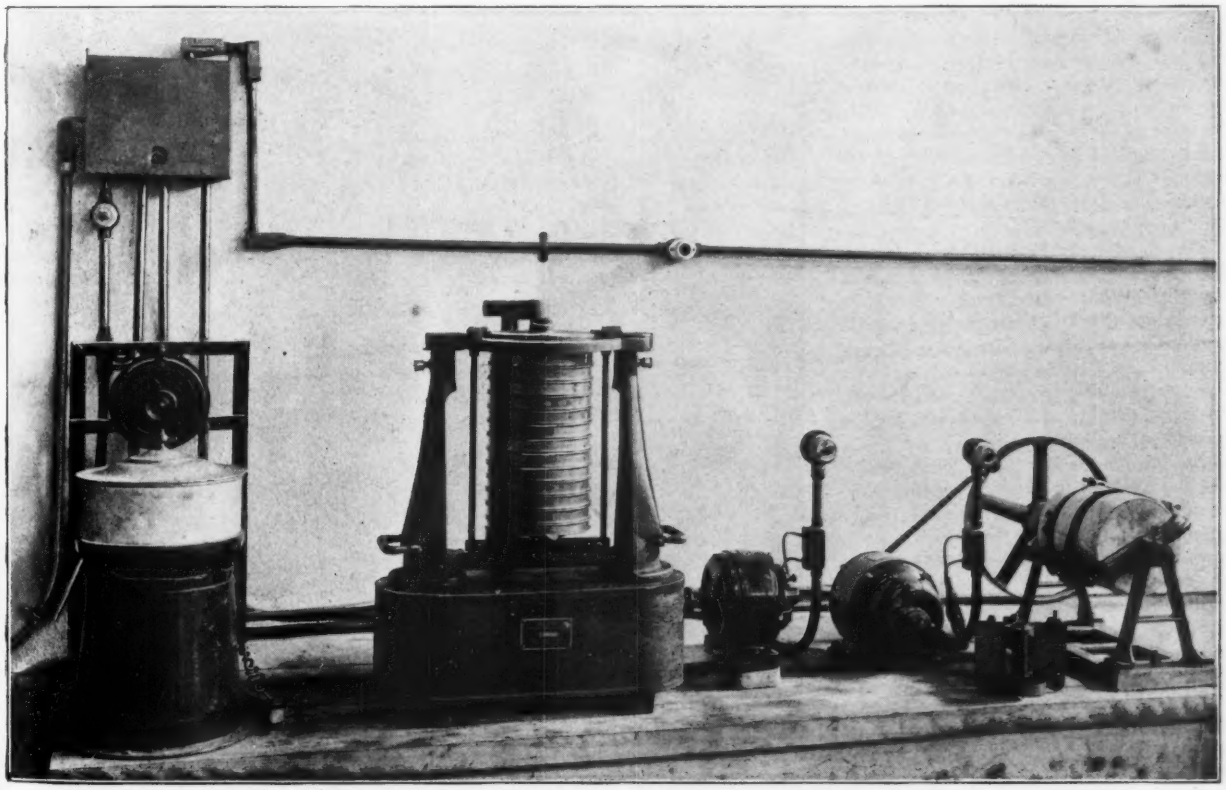


Fig. 2—Apparatus for testing and standardizing molding sands

to a sand of inferior merit. This method was first applied, it is believed, by Prof. Heinrich Ries and J. A. Rosen, in the report on molding sands to the State of Michigan in 1907.

Average Fineness

The Scranton method of indicating the average fineness of a molding sand is as follows:

A set of sieves including No. 20, 40, 60, 80 and 100 is used. Exactly 100 grams of sand is sifted one minute on the No. 100 sieve; the part that goes through is weighed, and the balance sifted on the No. 80 sieve; the process is repeated on all the other sizes of sieves. Any loss is credited to the No. 60 sieve, and any that does not go through the No. 20 sieve is credited to a No. 1 sieve. The weights of the sand going through each sieve are then multiplied by the sieve number and this divided by 100 gives the degree of fineness.

Sieve No.	Sieve Opening in Inches	Sieve Opening Plus Maximum Tolerance	Grain Size Retained
4	0.187	0.205	0.206
6	0.132	0.145	0.146
8	0.094	0.103	0.104
10	0.066	0.072	0.073
14	0.0468	0.0514	0.0515
20	0.0331	0.0413	0.0414
30	0.0234	0.0292	0.0293
40	0.0166	0.0207	0.0208
50	0.0117	0.0238	0.0239
70	0.0083	0.0116	0.0117
100	0.0059	0.0073	0.0074
140	0.0041	0.0066	0.0067
200	0.0029	0.0036	0.0037
200+	0.0028	0.0045	0.0046

The Parmelee method is as follows:

Where the standard set of sieves as recommended by the Bureau of Standards is used, ranging from No. 4 to No. 200, a more satisfactory factor of comparison than the older or Scranton method may be used. In substance it is the sum of all the quantities taken, based upon the grain size of the particles. This computation is based on the new notation, in which the sieve number replaces the "sieve mesh."

The figures in the first two columns, with the exception of the value assigned the No. 200 sieve, are those which have been adopted by the Bureau of Standards and other scientific bodies associated with it in the standardization of sieves. The third column's figures are calculated from the maximum tolerances allowed by the bureau. The fourth column of figures is derived from the third by adding one to the third or fourth figure, respectively, of the decimals in the third column. In the calculations to obtain the average grain size, the figures in the fourth column are the only ones that are used as the various multiplicands in obtaining the various products whose sum total denotes the average grain size and from which is derived the representative sieve number.

On this basis if the percentage amount retained on a sieve be multiplied by its grain size and the combined average be computed, the result will be the average grain size. If the reciprocal of this result be calculated the figures will show the mesh which all the sand would pass through if the grains were of a uniform size. The quotient would represent the average fineness of the sand, or, according to the new notation, the sieve number of the sand.

By this, the Parmelee method, the average fineness of the three types of sand under consideration have been calculated from actual sieve tests made by the author, and also their average grain size.

The great advantage of this method is this: After having ascertained the sieve number or mesh size through which all the grains would pass if they were of uniform dimensions, the figure thus obtained will point unerringly to the sieve number or average mesh size of the sand, and locate its maximum coarseness.

For instance, in the sieve tests of ten different sets of Lumberton sand made at Plainfield, N. J., for the Niles-Bement-Pond Co., the results showed that the greatest amount of sand retained clustered about the 20 to 40 mesh, but the average was closer to the No. 30 sieve than to any other. The Parmelee method confirms this conclusion by the computations which were made, the resulting figure pointing to No. 31 as the sieve number, or the average fineness of the sand if all the grains were of a uniform dimension. This method gives the foundryman a practical guide in either the selection of his sand or in suggesting to him what he must do when he wishes to blend his sand with other sand to produce certain desired results.

Methods of Testing

In the descriptions of the illustrations, in Fig. 1, for example, the method of making the permeability tests and the others depending upon it are fully described. In Fig. 2 the method of making the mechanical analysis or sieve tests is indicated in detail, for the purpose of enabling the reader to produce comparable results. The uses of the rotarex machine and the Abbe ball mill in making the tests are referred to. In addition it should be mentioned that in using the rotarex machine to obtain the amount of water to be added to a sand, the other steps to be taken in making the shearing tests are as follows: After the moistened sand is taken from the rotarex it is usually placed in the ball mill with 20 glass marbles and operated for 15 min. Then the moistened sand is removed, separated from the marbles, and molded into an open brass mold that is set on a plate of glass. The glass plate is first dusted with fine silica sand or other parting medium. The sand mold is 12x1x1-in. It is packed full of the moistened sand in just the same manner as a molder would fill a flask and ram it. The sand is pressed down twice by thumb-pressure, rammed twice with the handle of a molder's trowel, then pressed down and slicked off with the blade of the trowel or with the flat face of a molder's slicker. The snap-

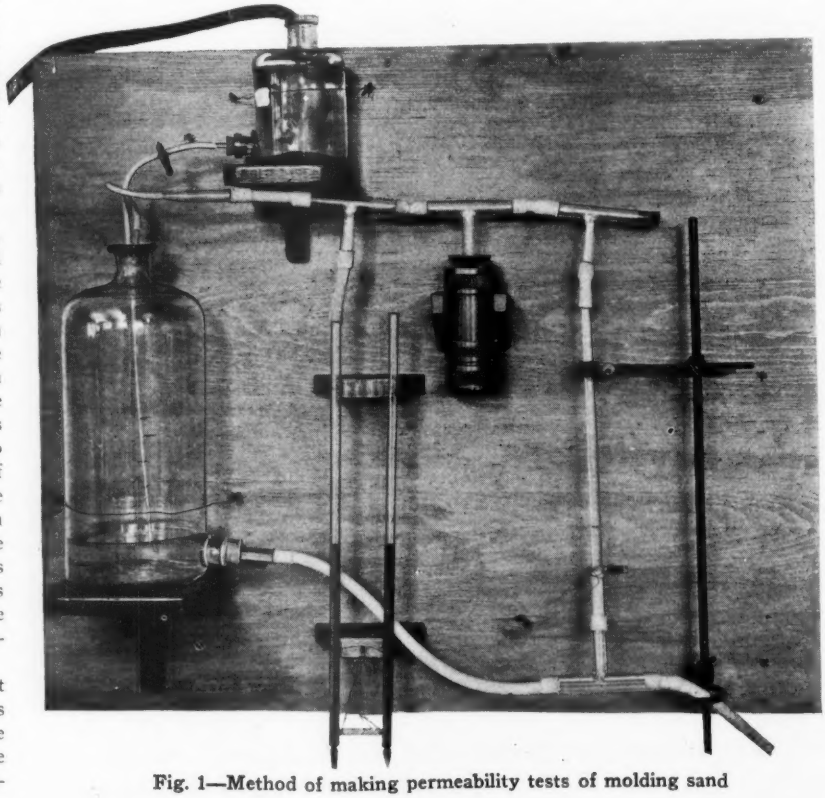


Fig. 1—Method of making permeability tests of molding sand

flask is then removed from the sand, leaving the sand-bar clean and perfect on the glass plate. The sand and the plate are weighed together, the difference in their weight representing the weight of the naked sand bar. The bar of sand is then pushed off the edge of the plate, by means of a horn spatula, into the pan or hopper of a scale, and the part pushed off is carefully weighed; its length is also measured. This operation is repeated on the remainder of the bar, until the last length remains on the plate; this length is also weighed and measured. The sum of the lengths broken off should equal exactly the total length of the bar, and the weights of the separate lengths should equal the total weight of the bar before it is broken. Any discrepancies show that the work has not been accurately done. When all the data are known the shearing stresses, bending moments and ultimate fiber stresses are calculated in the usual manner.

Description of the Illustrations

Referring to Fig. 1, the water is supplied to the Woulff bottle above from the tap below. The lower 8-liter bottle is supplied with water from the upper reservoir. On the supply line of rubber tubing is a pinch-cock to control the flow of the water. The supply tubing ends in a glass tube that reaches nearly to the bottom of the 8-liter bottle for the purpose of admitting the water quietly, so as to keep the pressure in the manometer free from undulations. The second line of tubing issuing from the top of the 8-liter bottle is the line that distributes the air pressure to the manometer, to the metal sand-holder in the center and to the registering burette on the right. The glass tees and rubber supply tubing are all of a uniform diameter. The manometer is constructed of two 50-ccm burettes with their side outlets turned toward each other and connected mouth to mouth by rubber tubing. The bottom outlets are closed by "policemen." They could have been sealed shut by fusion. The recording burette of the same internal diameter and capacity as each of the two burettes which form the manometer has its side outlet also closed by a "policeman." Its bottom outlet is connected to the outlet of the 8-liter jar by an inverted glass tee of the same internal diameter, and from there to the drain. The sand-holder is a metal cylinder in two parts; the lower part screws into the upper part by means of a coupling. The lower part is about 2 in. high by 2 in. internal diameter. Across its bottom is soldered a brass or copper wire screen of 18 to 20 mesh. The air-tight connection at the top, with the horizontal line, is made by means of one end of a glass tee that passes through a rubber stopper.

The principle of the test is the forcing of a stream of air through a given body of sand and measuring the velocity of its flow. The air in the 8-liter jar is displaced by the water which flows into it from the reservoir above at the control of the operator. The displaced air passes up and outward horizontally; as it passes it exerts a pressure on the connected arm of the manometer, on the recording burette as the water rises upward to meet the air pressure, and makes its exit through the sand in the holder.

Two hundred grams of the sand to be tested are dried to constant weight, then 10 per cent of water is added, and the entire amount is packed into the sand-holder. The packing is done in this way: The loose moistened sand is allowed to run into the holder, shaken down to a level, and then a 14-lb. lead weight, like a plunging piston, is allowed to fall exactly 2 in. upon the sand; each fall or blow of the lead weight is called a ram. Three rams are generally sufficient, but there are some molding sands so open in texture that a fourth ram becomes necessary.

Operation of Permeability Apparatus

The operation of the apparatus is as follows: The pinch cock on the right is closed. The water from the upper reservoir is allowed to flow into the lower reservoir as it will tend to keep the manometer at a constant level. As the water enters the lower reservoir it expels the air contained, this air passing out through the sand in the holder. As the water rises in the lower reservoir, it rises in the recording burette, and the two levels are constantly the same. The velocity with which the water rises in the recording burette, from cc. to cc. is recorded in seconds of time taken by means of a stop-watch. This velocity measures the speed with which the air passes through the sand, and therefore its permeability to air.

The first thing to do in making a series of tests is to find out what the rate of flow of the air is through the system unimpeded by the sand, or, in other words, when the sand-holder is empty. As there may be some variation in the internal diameter of the 8-liter bottle, taken vertically, or some inequalities in uncertified or unstandardized burettes that may be used, it may be necessary to take a great many observations through various zones of the recording burette, say from 45 ccm. to 35 ccm., or 43 ccm. to 33 ccm., etc., and if these variations amount to 1 per cent or more, then they must be accurately recorded and the knowledge made use of in carrying out the tests.

The rate of flow through the empty system is taken as unity or 100 per cent. The rate of flow through the sand is expressed in percentage of the rate of the flow of the air through the empty system, in order to have a basis of uniform comparison, no matter what the sand may be.

The ratio of the time consumed per ccm. to the manometer pressure is computed, also the inverse ratio of the flow of the air through the sand to its flow through the empty system is computed.

A description of the machine shown in Fig. 2 follows: The machine on the left is a rotarex. The upper part consists of an aluminum cylindrical pan with two covers, the smaller cover being removable for purposes of observation while a test is under way. This pan contains a circular bowl, which holds the sand to be tested. The speed of revolution of the bowl may be regulated by means of a resistance box, which is indicated by a circular disk with pointer above. A weighed amount of sand with a known amount of water is placed in the bowl. The speed of revolution is slow at first, so that the clay in solution will not be driven off by the centrifugal motion of the particles in the bowl. The expelled water finds an exit through the small spout shown at the left. The expelled water is caught in a beaker and measured. Its amount subtracted from the amount of water originally added gives the optima water content of the sand.

The next apparatus to the right is known as a rotap machine. As operated it contains a nest of 13 sieves numbered as 4, 6, 8, 10, 14, 20, 30, 40, 50, 70, 100, 140 and 200. The machine is used as an efficient aid in shortening the time required to make a mechanical analysis or sieve test of a molding sand. This machine is operated by the electric motor of ¼ hp. shown on the right.

One hundred grams of the sand, dried to constant weight at 110 deg. C., are placed in the No. 4 sieve at the top. The sieves are shaken by the machine for 5 min. Then each sieve is shaken separately by hand for 1 min.; the amount that passes through is transferred to the sieve next smaller in size. Then the whole nest with their contents is returned to the machine and shaken again for a period of 20 min.; then each sieve in turn is shaken by hand as before. The amount caught on each sieve is separately weighed and the computations made, the results being expressed in the percentages retained on each sieve. The amount passing through the No. 200 sieve is denoted as 200+.

The last machine on the right is known as a 1-gal. Abbe ball mill. It is a good substitute for a muller in mixing and kneading the particles of quartz and clay together which any good molding sand must contain. The motor to operate the ball mill is shown next to the mill; it need not be greater than ¼ hp. The small device with metal ring at the bottom, hollow spindle in the center and connected to four vertical paddles, shown between the motor and mill, is a device that may be inserted in the mill to promote the admixture of the clay and the silica, but it

did not work as well as was expected. A better device for the same purpose was found in the use of 20 glass marbles or alleys of a uniform diameter. It was found by experiment that while not heavy enough to exert any perceptible abrasive action on the sand, as is usually the case with heavy porcelain or steel balls or irregular shaped heavy flint pebbles, they exerted a mixing or kneading action almost equal to the thorough kneading and mixing of the incomparable muller with rolling wheels and shovel attachments.

The sand from the rotarex machine may be taken, and, with 20 glass marbles about ¾ in. in diameter, placed in the ball mill and revolved for 15 min. at a speed of about 80 r.p.m. This method of mixing is used in preparing the sand for shearing stress, bending moment and ultimate fiber stress. In the absence of a ball mill or muller, the sand may be mixed with its allotted amount of water by means of a burette dropping the water into the sand, drop by drop, in the meantime thoroughly mixing the water and sand together by means of a spatula, or by rubber-gloved hands, rubbing the sand across the palms of the hands to promote the most intimate mixture possible, without robbing the sand of any of its allotted moisture.

The Tests in Detail

For a general molding sand adapted to brass and kindred alloys the No. 2 Albany sand has been chosen as a basis for comparison.

Its physical appearance is usually a light brown or yellowish gray in color, more or less rounded grains, containing not more than 1 per cent of organic matter. Specific gravity varies from 2.5 to 2.65. It contains from 75 to 82 per cent of SiO_2 and seldom more than 4 per cent of Fe_2O_3 and as low as 2 per cent. The porosity is from 35 to 44 per cent. The melting point may run as low as 1350 deg. C. and as high as 1375 deg. C. Its optima water content may run as low as 4 per cent and as high as 7.5 per cent, depending upon its clay content. The amount used in tempering it for molding varies from 7.5 to 10.5 per cent of water.

Its average fineness varies greatly, according to grading and locality. According to the Scranton method its average fineness is 96.72, although some of the No. 2 Albany will show an average fineness as low as 84 per cent. According to the Parmelee method its average grain size is 0.005287+ in., and its average fineness is 189; that is to say, if all of its grains were of a uniform size they would pass through a No. 189 sieve.

The data for the shearing stress, bending moment and extreme fiber stress are as follows:

Shearing stress	4.4 grams per sq. centimeter
Bending moment	19.69 grams per sq. centimeter
Fiber stress	29.47 grams per sq. centimeter

Its textile strength, according to various authorities, may reach, with light tamping, as much as 4.4 lb. per sq. in.

In the permeability and associated tests the sand was dried to constant weight, with 10 per cent of water added to temper it.

	1st Ram	2d Ram	3d Ram
Permeability, per cent	43.16	35.6	32.8
Ratio of time to pressure, M=37 cc.	0.535	0.663	0.719
Ratio of flow of air through system to flow through sand	1:2.26	1:2.8	1:3.04

Another way of arriving at a judgment of the grain size of a molding sand is the practical method adopted by many skillful foundrymen of dividing the series of sieves into zones. For example: In the first zone for an Albany sand would be the coarser grains ranging from No. 4 to No. 50 sieve, inclusive, with 2.55 per cent retained; from 70 to 100, inclusive, with 8 per cent retained; from 140 to 200, inclusive, with 38 per cent retained; with the amount passing No. 200 at 52 per cent. These figures express the character of the sand at a glance. The zoning system may embrace or exclude any number of sieves desired, and may be applied to any molding sand.

For an iron molding sand, the well known Lumberton sand will be used as typical. Its physical appearance is generally a rusty brown, irregular in grain, some of them sharp, others rounded, accompanied sometimes by agglomerated grains; in the hand and between fingers it has a gritty characteristic, well known Lumberton feeling, a really very noble molding sand. Its specific gravity is usually about 2.6. Its silica content varies from 80 to 86 per cent. The porosity runs from 40 to 48 per cent. The melting point may run as low as 1500 deg. C. and as high as 1565 deg. C. Its optima water content may be as low as 4 per cent and as high as 9 per cent, depending upon the clay it contains and the presence of some agglomerated grains.

Its average fineness, Scranton method, is about 27. According to the Parmelee method its grain size is 0.03182+ and its sieve number is 31. Its shearing stress is 5.27 grams per sq. c.; bending moment, 17.9 grams per sq. c.; fiber stress, 26.9 grams per sq. c. Its tensile strength, according to various authorities, with light tamping, is about 24 lb. per sq. in., and with heavy tamping is 43 lb. per sq. in.

The permeability tests were taken with 200 grams of sand, plus 80 ccm. water, revolved in a rotarex machine for 45 min. The optima water content was 8 ccm.

	1st Ram	2d Ram	3d Ram
Permeability, per cent	81	58	52
Ratio of time to pressure	0.0327	0.453	0.51
Ratio of air flow through system to flow through sand	1:1.234	1:1.71	1:1.92

The manometer pressure M=33 ccm.

By the zoning system of estimating the value of a sand, the sieve analysis showed that from No. 4 to No. 14 sieve, inclusive, with 11.5 per cent retained; from 20 to 50, inclusive, with 73 per cent retained; from 70 to 200, inclusive, with 10 per cent retained, and about 5.5 per cent passing the 200 sieve. The maximum amount of sand retained was somewhere between the No. 30 and No. 40 sieves, which the Parmelee method indicated.

Steel Molding Sand

The Providence, Portage or Cedar Lake Gravel may be chosen as typical for the general run of steel molding work. In general the physical appearance varies from a light gray to a light brown. Its grains may be sharp or round, but distributed with some uniformity. Its specific gravity ranges from 2.6 to 2.63. Its porosity runs from 39 to 42 per cent. Silica content may range from 92 per cent to 98 per cent; in the latter case some binding material must be added to make it useful as a molding sand. Some of the steel sands used in the general run of steel casting work contain as much as 3.5 per cent clay adhering to the quartz particles, and some of them contain as much as 5.8 per cent of the combined water. Where a natural steel sand contains no clay, that ingredient must be added to the sand to give it the necessary bond. The melting point varies from 1580 deg. to 1700 deg. C. The optima water content may run as low as 1 per cent and as high as 7 per cent.

The definite figures given below are based on the results of tests made upon Cedar Lake Gravel at the laboratories of the Pond works. The average fineness by the Scranton method is 14.85. By the Parmelee method the average fineness is 24, and the average grain size is 0.04145+. Its shearing stress is 5.38 grams per square c.; bending moment, 31.85 grams per sq. c.; fiber stress, 47.75 grams per sq. c.

Its permeability and associated tests were made upon 200 grams of the sand, with 80 ccm. water added, placed in a rotarex, and revolved for half an hour. Optima water content was 7 per cent. The manometer was kept to a constant pressure of 27 ccm.

	1st Ram	2d Ram	3d Ram
Permeability, per cent	38.9	23	16.2
Ratio of time to pressure	0.83	1.41	1.99
Ratio of air pressure system to sand	1:2.56	1:4.3	1:6.1

According to various authorities the tensile strength of steel molding sands in their natural state ranges from 1.5 to 2 lb. per sq. in.

The zoning system applied to the Cedar Lake gravel shows that the sand retained on the sieves Nos. 4 to 10, inclusive, amount to 15 per cent; from 14 to 40, inclusive, to 70.3 per cent; from 50 to 200, inclusive, to 11.5 per cent, and only 2.3 per cent passed the 200 mesh. The Portage silica sand makes its best showing from No. 40 to No. 70 sieve, inclusive, which retain 72 per cent of the sand, with about 1 per cent passing the 200 numbered sieve.

Practical Chemistry for Lime and Cement Manufacturers

XXII. The Chemistry of Combustion—Amount of Heat Carried off by Waste Gases

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HEAT IS LOST in burning lime and cement from two causes: First, carbon burned only to carbon monoxide, and, second, the temperature of the gases. As you will see by referring to the table in the last issue, 1 lb. of carbon burned to carbon dioxide will produce 14,580 B.t.u., while by referring to the table of the heats of formation it will be seen that 12 lbs. of carbon burned to carbon monoxide will produce 29,160 cal. or 1 lb. of carbon, 2430 cal. or 4374 B.t.u. It will be seen, therefore, that there is a large loss of heat when carbon is burned to carbon monoxide and not the dioxide. By analysis of the waste gases we can find the percentage of carbon monoxide, and since 1 cu. ft. of carbon monoxide burned to carbon dioxide produces 344 B.t.u., the actual heat carried off in B.t.u. per 100 cu. ft. of waste gases is the percentage of CO multiplied by 344.

The heat carried off due to the temperature of the gases is found by multiplying the percentage of each gas present by its mean thermal capacity per cubic foot (see table) and by the temperature found less the temperature of the air. The sum of the products is the heat carried off by 100 cu. ft. of gas.

For the total heat carried off, the heat in the water vapor must be calculated. This is found by calculating the volume of water carried in by the air and also that produced by the hydrogen of the coal when burned and that present in the coal. This is multiplied by the mean thermal capacity per pound of water at the temperature found. Knowing the volume of gas per pound of coal and the heat units carried off by a given volume of gas, it is a simple matter to calculate the heat units lost per pound of coal. To this must be added the heat in the water vapor for the total heat lost. To find the percentage loss, divide the heat carried off per pound of coal by the thermal value of the coal, and multiply the quotient by 100.

Example: In the furnace gas given above, the loss due to CO per 100 cu. ft. is

$$0.9 \times 344 = 309.6 \text{ B.t.u.}$$

If this gas is 560°F., and the air entering the furnace is 60°F., the difference between the two temperatures is 500°F. The waste gases carry off, therefore, per 100 cu. ft.—

	Pct.		B.t.u.
CO =	0.9		
O =	7.4		
N =	80.2		
	88.5,	$88.5 \times 0.0193 \times 500 =$	854
$CO_2 =$	11.5,	$11.5 \times 0.0265 \times 500 =$	152
		Heat lost per 100 cu. ft. =	1,006

Suppose the coal to have 1 per cent moisture and 2.5 per cent hydrogen, the latter would produce $0.025 \times 9 = 0.225$ lb. of water per pound of coal. The amount of moisture carried in by the air is very small and may generally be neglected. To consider it, however, if completely saturated, air at 60°F. contains 0.015 lb. per cu. ft. Referring to the previous example, we find the analysis shows 15.3 lbs. of air were used per pound of coal. Hence the air for 1 lb. of coal carried in $15 \times 0.015 = 0.225$ lb. of water. Hence the total moisture in the gases from 1 lb. of coal $= 0.225 + 0.225 + 0.01 = 0.46$ lb. Heat carried off by moisture $= 0.46 \times (0.42 + 0.00010 \times 500) \times 500 = 108$ B.t.u. per pound of coal.

Now, 1 lb. of carbon liberates 30 cu. ft. of either carbon dioxide or carbon monoxide. Hence 100 cu. ft. of gas $= (11.5 + 0.9) \div 30 = 0.41$ lb. carbon. If the coal contains 85 per cent carbon, 100 cu. ft. gas $= (0.41 \times 100) \div 85 = 0.48$ lbs. coal. Now suppose the coal to have a thermal value of 13,000 B.t.u. per pound; then 0.48 lb. of coal would liberate $13,000 \times 0.48 = 6240$ B.t.u. The total heat carried off by 100 cu. ft. of gas $= 300 + 1,006 + 108 \times 0.48 = 1,358$ B.t.u. The heat generated by 0.48 lb. of coal (= 100 cu. ft. gas) = 6,240 B.t.u. Therefore, percentage loss $= (1,358 \times 100) \div 6,240 = 21.9$ per cent of the total heat applied.

A short method of calculating the heat passing up the chimney is as follows. One pound of carbon burned to carbon dioxide, as we have seen, will produce 30 cu. ft. of this gas and also will liberate 14,540 B.t.u. If a represents the percentage of carbon dioxide found by analysis, $100 - a$ will represent the combined percentages of nitrogen and oxygen. If 1 lb. of carbon produces 30 cu. ft. of carbon dioxide, the amount of oxygen and nitrogen produced along with it may be found from the proportion $30 : a :: x : (100 - a)$, hence

$$x = \frac{30 \times (100 - a)}{a}$$

If t be the temperature (°F.) of the air entering the grate, and T (°F.) that of the chimney gases, $T - t$ represents the rise in temperature. The mean thermal capacity of a cubic foot of carbon dioxide may be taken at 0.027, and that of nitrogen and oxygen at 0.019.

Now the heat lost in the carbon dioxide produced per pound of carbon burned will be $30 \times (T - t) \times 0.0027$, and the heat lost in the oxygen and nitrogen produced at the same time will be

$$30 \times \left(\frac{100 - a}{a}\right) \times (T - t) \times 0.019$$

The total heat lost will then be

$$30 \times (T - t) \times 0.027 + 30 \left(\frac{100 - a}{a}\right) \times (T - t) \times 0.019$$

or, that lost per pound of carbon burned =

$$30 (T - t) \times \left(0.027 + \left(\frac{100 - a}{a}\right) 0.019\right) \text{ B.t.u.}$$

and percentage of heat lost =

$$\frac{\text{Heat lost per pound carbon} \times 100}{14,540}$$

$$= (T - t \times \left(0.0056 - 0.0039 \times \left(\frac{100 - a}{a}\right)\right)$$

Referring to the previous example we have for heat lost

$$30 \times 500 \times \left(0.027 + \left(\frac{100 - 11.5}{11.5}\right) \times 0.019\right) = 2,599 \text{ B.t.u.}$$

and percentage of heat lost $\frac{2,599 \times 100}{14,540} =$ 17.9 per cent

or $(550 - 50) \times \left(0.0056 - 0.0039 \times \left(\frac{88.5}{11.5}\right)\right) = 17.8$ per cent.

(To be continued)

Austria May Export Portland Cement in 1921

CONSUL CAROL H. FOSTER, with the American Mission at Vienna, reports that in consequence of more plentiful fuel the Austrian cement industry has been able to increase production for 1920 by approximately 20 per cent. The output for the year will amount to 120,000 or possibly 130,000 tons. This is far below the capacity of the industry and only about 22 per cent of the normal needs of the region now comprised within Austria. It is expected that exporting will be resumed, at least to some extent, during 1921.

Editorial Comment

Presidents and Executive Officers of Some of the Big Railway Systems Tell Rock Products Their Attitude on Crushed Stone, Sand, Gravel and Slag Business

THERE IS INCREASING evidence from many sources that the railway managements are beginning to recognize that some of their shippers need help if the business of both is to be maintained. They have already learned that increased freght rates, in many instances at least, have not resulted in increased revenue.

Blanket rate increases are like blanket rates. They must ultimately be adjusted to local conditions or the industry must adjust itself to the new conditions. Blanket mileage scales of rates, while they may be just and proper for an undeveloped territory, inevitably result in hardship in a territory already developed on a different scale of rates.

The problem is: Which will work a greater hardship, a readjustment of the industry or a readjustment of the rates. Rock products producers as a whole are not much in favor of a readjustment of their industry, at least not an abrupt one, such as would result from the establishment of mileage scales by order of the Interstate Commerce Commission, or by the orders of the various state commissions.

There is pretty fair evidence, however, that we are gradually, and possibly unconsciously, approaching something like a mileage scale in many districts. If this is a gradual evolution, it may be a desirable thing. That is something for producers to consider while there is yet time.

How this pressure for a mileage scale of rates is actually being brought about by the shippers themselves is explained by Addison R. Smith, vice-president of the Louisville & Nashville R. R., in a letter to the editor, as follows:

"Everything is tending towards the very substantial equality in rates as within sub-sections of the country. The disposition of State Commissions is towards substantial uniformity in rate sections, in that a given set or line of rates in one state will be made the maximum in another. We find a strong disposition on the part of the shippers to use rates in effect on one line to argue for a corresponding adjustment on another line, although there may be no actual or substantial competition between the shippers on each.

"The pressure on the part of the shipper is always for lower figures. Now, if it so happens, under the theory which is advanced in your letter, that one railroad finds it may adopt fairly either a special or a joint scale of rates on a given commodity under a very low measure of revenue, it does not follow that another road, perhaps equally as prosperous, finds that it can, as successfully, use the same measure. Yet, the shipper on this second road is inclined to insist upon an exact parity with the shipper on the other road enjoying the lower measure, and, as indicated above, the disposition on the part of the commissions is to favor that contention.

"There is, to my mind, too, doubtful validity in making any rate on a basis of either a minimum or a small profit above 'out-of-pocket' costs, for such action presumes that other classes of traffic will have to bear the first-mentioned commodity's share of all expenses.

"It used to be the practice of carriers of low-grade commodities, such as stone or brick, to move from producing point to some nearby center of large consumption on a basis of rates which were figured at bare hauling cost, or even less, so as to enable the producer to meet local or nearby competition. The profit came from handling of the commodity to local stations, or elsewhere, on basis of rates which were remunerative. Such low rates were usually referred to as 'dumping' rates. I do not believe that under the present law we could sustain any such policy at the present time, for there is ground for solid presumption that the rates, other than the 'dumping' figures, had to absorb an undue share of the transportation burden.

"On the general subject of uniform rate scales, I can say that I am old-fashioned enough to believe that we should not adopt such under an inflexible policy, either in the general groups to which the carriers are assigned, or in sub-sections thereof, believing that diverse requirements of traffic, differences in operating conditions, and other reasons may warrant along one line a set of rates that may be either too low or too high in the section served by another line. Nevertheless, as indicated above, I believe that we are rapidly approaching the time that, in certain sub-sections of the country at least, we will have to closely approximate substantial uniformity.

"In addition to the reasons I have given above, is the fact that competitive adjustments, substantial lack of exemption under the Long and Short Haul Law provisions of the Act to Regulate Commerce, close proximity of one road to another in succession as one moves across the country, will tend to this end.

"I may say, in general answer to a part of your inquiry, that I see no tendency at all on the part of traffic managers in the South, at least, to abandon the old feeling of support to the manufacturing of producing interests served by their respective rails. I am quite certain there isn't a one of them but realizes that the development and promotion of businesses along their lines means their own prosperity. I am sure that they all may be relied upon to go as far as they may within legal limitations, or traffic policies which are authoritatively fixed for them, and that their common sense training teaches.

"Speaking for the Louisville & Nashville Railroad, I may say it is the purpose of its management as to the stone business, and to all other lines of production and business, to go as far as our own circumstances and the laws will permit in the endeavor to extend trade, instead of restricting and confining it within narrow limits."

Accident Prevention

Belts and Belt Guards

Prepared for ROCK PRODUCTS *by the Engineering Department of the National Safety Council*

THIS IS the third and final installment of a series of articles begun in the January 15 issue of ROCK PRODUCTS.

Construction of Guards

Metal is preferable to wood in the construction of guards. Wooden guards, especially if oil soaked, increase the fire hazard; they also are more expensive in upkeep. Metal guards are practically indestructible, wear better and are more substantial. Where guards are subject to acid fumes, wooden guards may be necessary, however.

All guards should be of rigid and substantial construction. The railing guards, placed from 15 to 20 in. from the moving parts, should be of the double type, with the top rail 3 ft. 6 in. from the floor, and an intermediate rail midway between the top rail and the floor.

If constructed of rolled shapes, their section should be at least equal to that of 1½ x 1½ x 3/16 in. angle iron. When the railings will be subjected to considerable handling or stresses, 2 x 2 x ¼ in. angles, or their equivalent, should be used. If constructed of pipe, they should be not less than 1¼ in. inside diameter. If constructed of wood, the posts should be not less than 2 x 4 in., or their equivalent section, and the rails not less than ⅞x6 in., or their equivalent section. Uprights in all instances should be spaced not more than 8 in. centers. Preference is given to railings constructed of rolled shapes, as they are less likely to fail. The use of wood should be avoided where practicable.

Guards consisting of frame work, with mesh or plate filling, will vary as to strength of material used according to the area of the guard.

If the guard is 6 ft. in height and fastened to the floor without other support or bracing, the metal frame of the guard should have a section at least equal to that of an 1¼ x 1¼ x ⅛ in. angle iron. The filling material is usually attached to an angle frame by means of ¾ x ⅛ in. flats, fastened to the angle by 3/16 in. bolts or rivets, spaced not more than 10 in. centers, or by 1 x 1 in. wooden strips fastened to angle by 3/16 in. bolts. Perforated or sheet metal should be bolted or riveted directly to the angle, or spot welded. For a pipe frame a 1¼ in. open seam tube is recommended with the filler clamped in the seam of the tubing.

When the dimensions of the guard are not more than 3 ft., or where it is braced every 3 ft., the frame should be equivalent in strength to ¾ x ¾ x ⅛ in. angle iron, or ¾ in. open seam tubing.

Filler

Filling material should not have openings larger than ½ in. when the guard is placed within 6 in. of a moving part, nor larger than 2 in. (1½ in. recommended) when more than 6 in. and less than 15 in. from the moving part.

When the area of the guard between braces is 4 x 4 ft. it is recommended that wire mesh be at least No. 12 U. S. gauge, 1½ in. mesh or perforated or sheet metal of at least No. 14 gauge, but 10 gauge is recommended.

No. 16 gauge, perforated or sheet metal, will make a substantial filler when the area between stiffeners does not exceed 3 x 3 ft.

The filler used for smaller areas may be of smaller gauge metal, but a gauge smaller than 18 should not be used because lighter guards have a short life.

All guards should be substantially fastened in place, and, where it is necessary to have access to machinery, portions of the guard should be arranged to swing.

All sharp edges of filler should be protected and where hand holes are provided the edges should be reinforced by at least No. 24 gauge sheet metal, but No. 18 gauge is recommended. When a gate or door is required, it is recommended that the frame be at least equal to 1 x ⅝ x ⅛ in. angle, and that means be provided to hold it securely in place.

Design of Guards

Care should be exercised in the design of guards to provide convenient access to parts which must be repaired or maintained. This may be done by making the guards movable or by providing doors or removable panels.

Accident Prevention in Stripping of Overburden

By L. J. Boucher, Superintendent, Atlas Portland Cement Co., Hannibal, Mo.

DURING THE two years of 1918 and 1919 6 per cent of the total number of injuries causing loss of time in the Hannibal quarry was due to the stripping operation. Of this there were none on the hydraulic stripping; 4 per cent of the total was due to drag-line excavator stripping and 2 per cent to hand stripping. The principal hazards in hydraulic stripping are those which are present when changing the heavy pipe lines. The carelessness of a workman may cause a joint to fall upon a fellow employe or himself. Care should be taken when blocking up pipe and the tools must be in good condition. During the operation the man at the nozzle should at all times observe where he is aiming the stream of water which issues with tremendous force.

The larger portion of the stripping at the Hannibal quarry is done by means of a large, revolving drag-line excavator machine, having a boom 100 feet long. It is moved about on wooden rollers placed on timbers. All gears and pinions are guarded and substantial railings are installed about the engines. Steam pipes are insulated and boxed-in wherever they are exposed to possible contact with the workmen. The pitmen are warned to stay clear of the machine when it revolves and no person is allowed to stand in the path of the drag-line cable, as occasionally the operator allows slack, which, when taken up, causes a sudden jerk, the force of which could injure a man severely. As another safety measure, the workmen are cautioned never to stand with their feet on the timbers upon which the rollers move.—"Accident Prevention Bulletin" of the Portland Cement Association.

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New Machinery and Equipment

Lime Hydrator Adapted to Sand-Lime Brick Manufacture

IT IS A well-known fact that complete hydration of lime is one of the essentials for successful sand-lime brick manufacture. W. T. Toepfer & Sons Co., Milwaukee, Wis., who also operate the Acme Brick Co., Barton, Wis., manufacturers of sand-lime brick, have built a hydrator, especially adapted for that purpose.

The Toepfer process for the hydration of lime is very simple.

The machine itself is very simple in construction and is economical to operate as only one man is required and it does not take much power. Since the working parts all run at slow speed they do not wear out quickly.

The quicklime is fed in batches into one of the enclosed revolving drums of the machine, either in large-sized lumps as they come from the lime kiln, or in the form of crushed or ground lime. It is, however, not at all necessary to crush the lump lime.

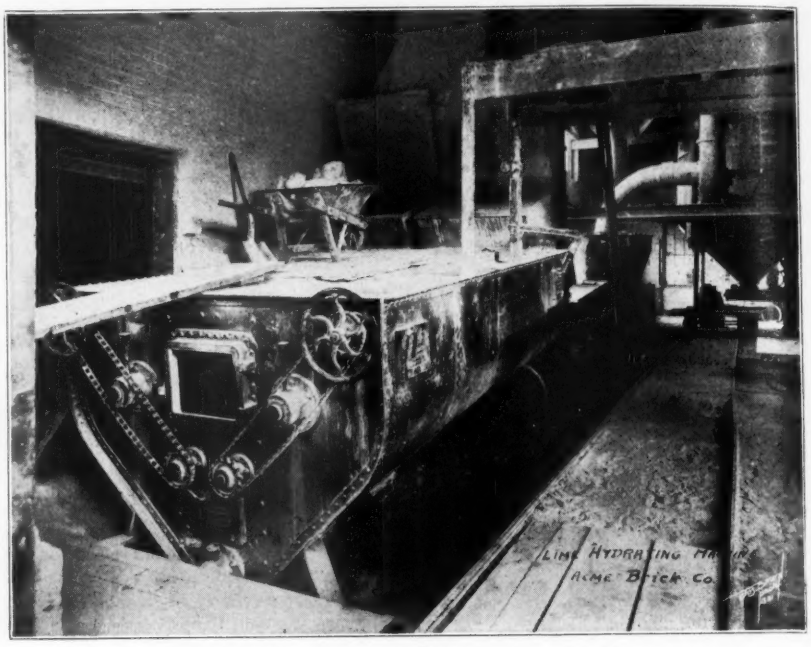
The several hydrating drums of this machine are entirely enclosed in a metal housing. After the batch of lime has been fed into one of these revolving drums the required amount of water is added and the lime and water are slowly revolved until the desired degree of hydration has been reached, when it is let out into the finishing trough, from which it is run in a continuous stream to the grinder, screen or vacuum separator in the form of a dry flocculent powder.

After leaving the hydrating drums the lime is conveyed up the finishing trough to a point where the hydrate is separated from the core by a coarse screen and is spouted into the mill for air separation or to the final screening machine. The tailings or core are run out at the end of the conveyor.

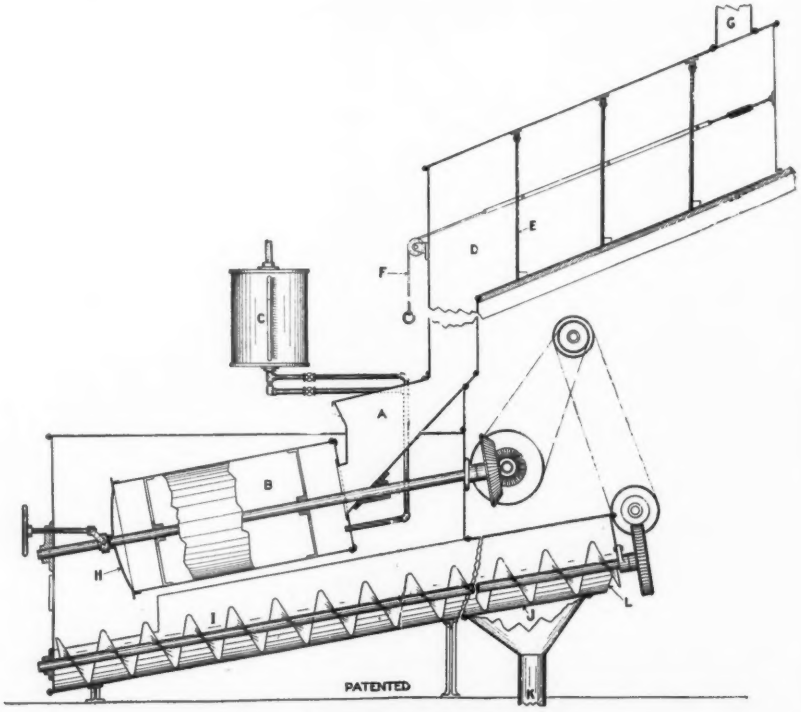
This hydrator is claimed to be a dustless machine. The dust and steam created during the process of hydration are drawn up a stack into a dust collecting chamber (usually on the roof of the building), where the fine particles of hydrate are separated from the vapor to be returned to the machine, the steam escaping through another stack.

MECHANICAL DESCRIPTION OF HYDRATOR

A—Charging chute through which quicklime is introduced into the machine. B—One of the hydrating cylinders in which the lime is held, with required amount of water, until hydrated. C—Water tank, graduated to show correct amount of water required to hydrate each batch of lime. D—Dust-catching chamber. E—Screens through which steam must pass. The fine particles of lime are here separated from the steam. F—Rope and spring attachment for shaking lime dust from screens. G—Stack to allow free steam to escape. H—Outlet door to hydrating cylinder, which is opened by the operator to allow hydrated lime to escape from cylinder into the finishing trough. I—Finishing trough. J—Coarse screen through which the hydrate flows. K—Outlet spout leading to grinding mill, air separator, etc. L—Outlet for core.



Depositing lime in one of the hoppers of hydrator



Cross sectional view of hydrator

New Uses for Power Scrapers

SAUERMAN BROTHERS, Chicago, Ill., manufacturers of a well-known cableway excavator, have recently issued a new bulletin on their bottomless power scrapers, which contains many useful suggestions for sand, gravel, and crushed stone plant operators.

The operating principle of a bottomless power scraper is very simple. The scraper is just dragged back and forth between digging point and dumping point by a double-drum friction hoist.

The front drum of the hoist operates the "load" cable, which leads through sheaves from the front drum to the bridle chains on the front of the scraper. The "pull-back" cable leads from the rear drum through guide blocks located at the far end of the excavation and is then attached to the rear bridle chains on the runner-frame of the scraper.

When the scraper is at the point of digging, the operator throws in the friction of the front drum and disengages the friction of the rear drum. This puts the "load" cable into operation, which pulls the scraper forward and causes the cutter edge to dig, the material thus loosened filling in between the two side-plates of the scraper. The loaded scraper is then pulled over the ground at a speed of about 200 feet per minute to the point of dumping. When the scraper reaches this point, the operator disengages the front drum and throws in the friction of the rear drum, putting the "pull-back" cable into operation. Being bottomless, the scraper leaves its load at the point where it starts its backward travel.

The digging radius of a scraper is limited only by the length of the operating cables, but it is not generally economical to exceed an operating span of 500 ft. in handling sand and gravel. Spans up to 300 ft. are most favorable.

The illustration at the bottom of the page shows how a scraper of this type may be used for operating a standard sand and gravel pit. The other view shows a possible use for the scraper in reclaiming material in ground storage piles.

An installation of this type, using an ordinary drag scraper bucket, is in use at the yards of the Ohio River Sand Co., Louisville, Ky., and aroused much interest in the visiting members of the National Association of Sand and Gravel Producers attending the recent convention in that city.

In this particular installation, the ground storage piles of material are made by dumping from a trestle. Bottom dump cars are loaded from scows at the waterfront, and run over these trestles and emptied into pyramidal piles. At one end, between the piles, is a hopper with truck and wagon-loading bins underneath.

It is obvious that the same method of recovering the material from ground storage piles could be used with any system of conveying the material to the piles—overhead belt conveyors, a cableway, or a modification of the railway and trestle. Of course, a certain amount of the material under the trestle and around the posts is dead storage with this method of recovery, but there is hardly any system of recovering ground storage that does not involve some dead material.

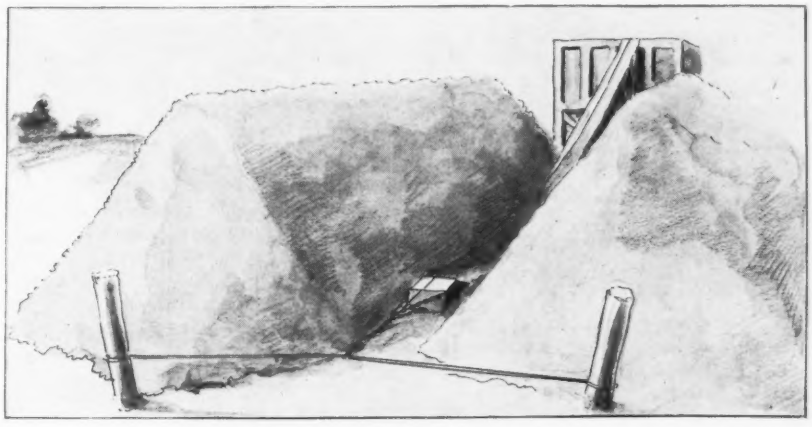
With a 500-ft. haul, Sauerman installations are claimed to have capacities ranging from 50 cu. yd. per hour for a ⅓-yd. scraper to 309 cu. yd. per hour for a two-yard scraper. These capacities are based on an in-haul speed of 200 ft. per minute of the loaded scraper and an out-haul speed of 400 ft. per minute for the empty scraper.

An installation of this kind is very flexible and capable of many uses, such as stripping a sand and gravel deposit or quarry, where the character of the over-burden will permit.

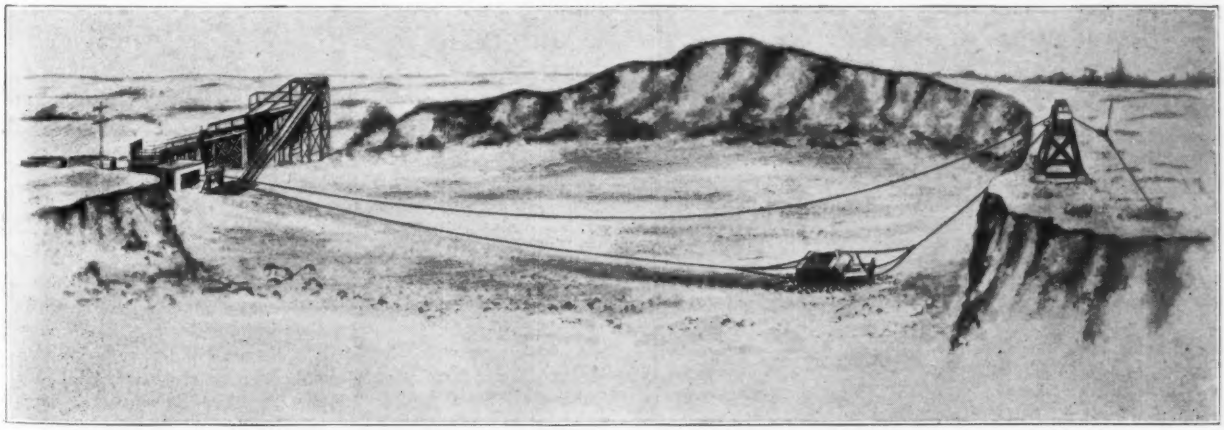
Clamshell Bucket for Heavy Dredging

THE BLAW-KNOX CO., Pittsburgh, Pa., has recently placed on the market a newly designed bucket for heavy excavating and dredging.

This bucket is particularly adaptable for all kinds of dredging under water—the parts being designed especially to resist the wearing and abrasive action of sand and other materials.



Scraper used for reclaiming material in ground storage piles



Sauerman power scraper put to a new use—sand and gravel plant operation

General Market News

Conditions in Lehigh Valley Cement District

WHILE THE END of the first month of 1921 finds the majority of the cement mills in the Lehigh Valley district of Pennsylvania idle or operating at considerably reduced capacity, the aspects of early resumption are bright, and with definite revisions in wage scales to suit the present market conditions, it is likely that another few weeks will see much greater activity. With storehouses practically empty and with definite certainty of call for material at an early date for road-building and general construction, there must necessarily be a noticeable increase in production.

Market quotations at the mills as well as in the important eastern markets hold firm at recently established levels, and while further declines are not unexpected, it is uncertain just when they may come. Dealers at New York are quoting the material at $4.50 a barrel delivered, with bag rebate of $1 per barrel. This is the approximate level in other important cities of the state, the price being $4.75 at Buffalo; $4.80 to Syracuse; $4.50 at Rochester; $5 at Jamestown; while further south, at Albany and Troy, figures of $5.20 and $4.80, respectively, prevail. Boston, Mass., shows a decline from the $5.50 price noted in the last issue of ROCK PRODUCTS, the figure now standing at $5, with 25-cents per bag, or $1 per barrel, rebate. Providence, R. I., still holds at a high level, $5.60 being asked by local dealers, with a bag rebate of 22½ cents.

The big plant of the Atlas Portland Cement Co., at Northampton, Pa., has practically ceased production, and a large force of men has been thrown out of work; the majority of the men have not been paid off, nor have their tools been taken from the plant, indicating that a quick resumption is likely to be decided upon at any time. At Coplay and vicinity, it is vacation season with a vim, and a big force of men are available as soon as the call comes. After a shutdown of several weeks, the Reliance mill of the Giant Portland Cement Co., Egypt, resumed operations on Jan. 25, and is about the first plant in the Lehigh Valley section to start up with any sort of an aspect of "keeping going." This company has construction under way on a large stone crusher, and to get the new plant ready for service, a double-shift of workmen is being employed. It is said that this crusher plant will be one of the largest works of its kind in the world. The Allentown Portland Cement Co. is making ready for operations at its large plant at Evansville, Berks County; repairs and improvements are under way, preparatory to what is anticipated as a long run. It is reported that the mill has been ordered in service at an early date.

Gravel Royalty Protested in Oregon

PROTEST against the payment of royalty to the State of Oregon at the rate of 10 cents a cubic yard for rock, sand and gravel taken from the beds of navigable streams in Oregon, was voiced at a meeting of the Joint Committee on Commerce and Navigation, held at Salem, Ore., recently.

The session was held to consider the proposed repeal of that part of the present sand and gravel law which makes it incumbent upon counties, municipalities and the state to pay royalty for materials used in public work. The original sand and gravel law was enacted at a special session of the legislature last January, and since that time approximately $42,000 has been realized from the source.

New Canadian Provincial Highway

CONSUL NORTON F. BRAND, of Fernie, reports that the Canadian government has approved the plans of the province of British Columbia for the construction of a highway from Vancouver to Hope and thence to Osoyoos and will pay 40 per cent of the cost. The extension of this highway to the Crow's Nest, near the Alberta border, will open up the scenic wonders of southern British Columbia to the motorist.

Michigan Cement Manufacturer Increases Cash Discount

The Huron Portland Cement Co., Alpena, Mich., and the Wyandotte Portland Cement Co., Wyandotte, Mich., make the following announcement regarding a change in cash discount:

For years the general practice customary in the industry has been "30 days net," with a fixed discount determined in cents per barrel for payment within 10 days. In the old days this amount per barrel was 1c (one cent); then it was increased to 2c (two cents); later, and finally, it was established at 5c (five cents) per barrel, which amount has been our discount to the trade for several years.

The Huron and Wyandotte Portland Cement companies, seeking to be guided by the most advanced commercial thought in constructively co-operating with its loyal customers in the furtherance of our mutual interests, and desiring to give our customers the benefit of all betterments and improved methods of doing business, that we can possibly formulate, as applicable to the "Cement Industry" consistent with our conditions, have decided upon and adopted the following important change in terms of discount, viz.:

Effective Feb. 3, on all invoices covering all shipments of Huron and Wyandotte portland cements on current orders and new business, the terms of payment will be as follows, viz:

"Thirty days net, with a special discount of 10c (ten cents) per barrel for cash payment strictly within 10 days from date of shipment," as against our former terms of "30 days net," with a discount of 5c (five cents) per barrel for payment in 10 days from date of shipment.

Slate Waste as a Building Material

THE MAKING of houses chiefly from slate waste is an experiment of much interest. The waste has been accumulating in quarries for three centuries, and is adapted for use in paints, putty, bricks, blocks, slabs, tiles, flooring, mortar, rubber and molded products, but hitherto, the cost of manufacture seems to have kept it from competition with other materials. Tried for roads, the slate has proven too dirty in wet weather. It is suggested as a promising binder in granite macadam; and bricks made from it have been found very strong and as resistant to water absorption as other bricks. Good drain pipes have been made from slate dust. For cement, the ground waste is claimed to be especially good, and near the quarries a mastic of slate dust and oil has been used often for repairing leaky roofs. This mixture, when it sets, is said to be harder and more durable than the natural slate rock.

Tariff on Limestone Proposed in Amendment

LIMESTONE and lime products are deemed by Senator Jones, of Washington, to be the proper subjects of emergency tariff legislation. He has introduced an amendment to the Emergency Tariff Bill providing the following duties: Lime in cooperage, 50c per 100 lbs., gross weight; lime in bulk, 30c per 100 lbs.; hydrated lime, 40c per 100 lbs., gross weight; limestone, broken or crushed in bulk, 15c per 100 lbs.; ground limestone in bags, 7½c per 100 lbs., and ground limestone in bulk, 5c per 100 lbs.

General Market News

Good Roads Convention

THE ELEVENTH annual American Good Roads Congress and the eighteenth annual convention of the American Road Builders' Association in conjunction with the twelfth National Good Roads Show was held at the Coliseum, Chicago, Ill., Feb. 8, 9, 10, 11 and 12. The show and convention is recorded as one of the greatest in point of attendance, the registration mark being well over 12,000.

The convention was attended by road and street contractors, army, automotive and chemical engineers, agriculturists, editors, bankers, motorists and large users of trucks, as well as officials of boards of trade, chambers of commerce and other organizations interested in road and street improvement.

The show at the Coliseum furnished a good picture of what goes to make up a good road. There on exhibition was everything needed to build a road—everything from huge steam shovels and concrete mixers to the tiny instruments used by surveyors to determine soil pressure.

One of the features of the exhibit was the demonstration staged by the Federal Bureau of Public Roads, Division of Tests, of impact tests that the bureau uses to determine the ability of soils to sustain roads and to measure the amount of wear on road surfaces caused by heavy traffic.

Michael J. Faherty, president of the Board of Local Improvements of Chicago and president of the American Road Builders' Association, stated in a speech before the convention that "1921 will be the greatest road building year of history." In view of the fact that the enormous appropriations for highway work now total $1,500,000,000, according to reports covering bond issues and direct levies for road building and road maintenance, President Faherty's statement was well justified.

In a telegram to the convention President-Elect Harding declared himself an earnest advocate of better thoroughfares.

"Good roads must supplement railroads and waterways if the development of the transportation system is to be complete," said the message.

"The use of our highways has increased from 500 to 1000 per cent during the last five years," Thos. H. McDonald, chief, U. S. Bureau of Public Roads, said. "The development of the motor truck has been so rapid that the adaptation of this vehicle to the roadways over which it operates has been seriously neglected.

"After all, the motor truck is the determining factor in the cost and building of roads and a problem that is national in its scope is that of an early agreement between road builders and road users as to the maximum load to be carried.

"However, be of good cheer. The $1,500,000,000 now available in the United States for road building will do much to relieve the present unemployment."

Denver Firms Cut Cement Price

THE United States Portland Cement Co. and the Colorado Portland Cement Co. announce a cut of 15 cents per barrel on their product in order to stimulate building. The reduction is effective Feb. 1. The companies have already increased their discount allowance from 5 cents to 10 cents per barrel, and thus the price on Feb. 1 will be 20 cents less than that prevailing in January. Officials of the companies state that prices are now practically at their pre-war levels, and point out that during the past four years prices on cement were advanced only 33 per cent, in spite of an advance of 25 per cent in freight rates.

Alsen Cement Co. in Hands of Receiver

THE Alsen Cement Co. of America, whose principal office is at 110 West 42d Street, New York City and plant at Alsen, N. Y., has been made a defendant in a suit by Julius De Vries of New Jersey, who claims $4,200. Liabilities of the company are given as $600,000 and assets as $2,225,000. Judge Hand, in the United States District Court, has appointed E. H. Childs as receiver in equity for the company.

The complaint states that the company is solvent, but that the assets cannot be converted into money with sufficient rapidity to meet current obligations and that loss is likely to result unless the property is taken over by a receiver. The defendant corporation consented to the receivership.

Price of Lime Cut in New York

MANUFACTURERS of lime have reduced prices $1 a ton to dealers in the New York district. The cut on patent lime is from $16 to $15 a ton, while the mill price on finishing lime is lowered from $14 to $13. Freight on the latter adds about $6.30 to the dealers' prices. Building material dealers have been asking $5.40 per barrel for finishing lime in New York, as against a new quotation of $5; common lime, in standard 300-pound barrels, has been selling for $5.20, and is now $4.80; hydrate lime in cloth is listed at $29 a ton, with 20-cent rebate for bags, as against $33.85 a few weeks ago. The figures noted are all for material delivered. Hydrate common lime, which has recently been out of the market listings, is now back at $24 per ton.

Comments From Our Readers

G. N., OF ILLINOIS, writes as follows:

The price of molding sand is governed by labor and up to this time labor has not come down very much. Since this is the winter season sand is very hard to ship and the price of molding sand will remain the same until June, 1921.

J. S. S., of Ohio, manufacturer of cement brick, makes the following comment:

The building trade is waiting for prices to strike bottom before there will be much activity. If cement prices would only drop enough to strike rock bottom and then bounce up a bit, it would tend to wake up the building industry.

Newhard Crusher Co. Starts New Plant

THE NEWHARD CRUSHER CO., Allentown, Pa., inaugurated the 1921 season with the starting of its new crushing plant, located north of Allentown, on Feb. 7. The inauguration was marked with a fitting ceremony.

Previous to the starting of the plant addresses were made by the officials of the company and prominent men of Allentown. Then the motors that operate the crusher were started, the belts started to move and the crushing machinery was in full operation.

A local newspaper describes the subsequent details as follows:

Mrs. Frank Merkle, daughter of the late Franklin Newhard, standing over the jaws of the main crusher, tossed in the first rocks. Sparks and fragments flew as the great jaws mashed the great masses, and then Mrs. Merkle completed the ceremony with a feature unique these days, pouring a bottle of wine into the jaws of the crusher. It was home-made grape of a rare vintage and was made by Mr. Newhard, upon whose estate the big quarries of limestone rock are located.

The quality of the stone produced in these quarries is excellent and has met the tests of the State Highway Department and other engineering departments for their work. For half a century stone has been taken from these almost inexhaustible beds, which are known to be at least 270 ft. deep and cover many acres of the Newhard farm. The company is now working on a 40-ft. vein that is rich in silica and cement rock formation. The new crushing plant is designed to produce 500 tons daily, with truck loading bins of 800 tons' capacity.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:			1.40 per net ton, all sizes			
Buffalo, N. Y.	1.00	.....	2.50	2.00	2.00	.....
Burlington, Vt.	1.80	2.25	2.00	1.80	1.80	.....
Califon, N. J.	1.75	1.75	1.75	1.50	1.50	1.50
Chaumont, N. Y.	1.80	1.80	1.80	1.65	1.65	2.00@2.25‖
Coldwater, N. Y.	1.45	2.50	2.40	2.00	1.60	1.45
Grove, Md.	.80@1.35	1.35	1.35	1.35	1.35	1.35
North Leroy			All sizes 1.50			
Munns, N. Y.	1.35	1.85	1.85	1.85	1.85	1.85
Redington, Pa. (dolomite)	1.00		All other sizes 1.50			
Utica, N. Y.	2.00	2.25	2.00	1.80	1.60	.....
Vernoy, N. J.						
CENTRAL						
Alden, Ia.	.80@1.00	.80@1.00	1.50	1.45	.....	.....
Alton, Ill.	2.00	2.00	1.75@2.00	1.75@2.00	2.00	2.00
Bettendorf, Ia.			All sizes, 2.00 cu. yd.			
Buffalo, Ia.	.90	1.35	1.45	1.25	1.25	1.35
Chicago, Ill.	1.41	2.00	1.53	1.41	1.41	1.41
Cincinnati, Ohio	.....	2.00	2.00	2.00	.....	.....
Cleveland, Ohio	.....	2.40	2.20	2.20	.....	.....
Columbia, Ill.	2.15	1.90	2.00	2.00	1.90	1.90
Coralville, Ia.	1.25	1.65	1.65	1.50	1.40	.....
Davenport, Ia.	1.50•	1.50•	1.50•	1.50•	.....	.....
Dundas, Ont.	1.00	1.50	1.50	1.35	1.25	1.20
Eden and Knowles, Wis.	1.30	1.30	1.30	1.30	1.30	.....
Ft. Wayne, Ind.	1.60	1.90	1.90	1.80	1.60	1.60
Greencastle, Ind.	1.50	1.50	1.25	1.25	1.25	1.25
Illinois, Southern	2.25	1.75	1.75	1.75	1.50	.....
Kansas City, Mo.	.60	2.00	.....	.....	.....	.....
Kokomo, Ind.	1.10	1.10	1.25	1.20	1.10	1.10
Krause or Columbia, Ill.	1.80	1.30	1.50	1.40	1.30	1.30
Lannon, Wis.	1.25	1.25	1.25	1.25	1.25	1.25
Lima, Ohio	1.70	1.60	1.50	1.50	1.50	1.50
Linwood, Ia.	1.00	.....	1.45	1.25	1.25	.....
Mansfield, Ohio	1.70	2.20	2.00	1.90	1.70	1.70
Mayville, Wis.	.95@1.00	.....	1.20	1.20	1.20	1.20
Montrose, Ia.	1.35	1.75	1.75@1.85	1.75	1.65@1.75	.....
Oshkosh, Wis.			1.40 per ton, all sizes			
Ottawa or Hall, Can.	2.00	2.25	2.25	1.75	1.75	.....
River Rouge, Mich.	1.25	1.50	1.50	1.50	1.25	1.25
St. Louis, Mo.	.60	1.60	.....	.....	.....	.....
Sheboygan, Wis.	1.30	1.30	1.30	1.30	1.30	1.30
Stolle, Ill. (I. C. R. R.)	.....	1.85	1.85	1.85	1.85	1.85
Stone City, Ia.	.80	.....	1.65	1.55	1.45	.....
Toledo, Ohio, f. o. b. cars	1.85	2.10	2.10	2.10	1.85	1.85
Toronto, Canada	1.75	2.40	2.40	2.40	2.15	2.15
SOUTHERN:			These prices include 90c freight			
Cartersville, Ga.	.....	.....	2.00	2.00	2.00	2.00
Chickamauga, Tenn.	1.50	1.75	1.75	1.75	1.75	1.75
Columbia, S. C.	1.00@1.25	3.50	3.50	3.50	.....	.....
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Fort Springs, W. Va.	1.85	2.00	2.00	1.70	1.60	.....
Garnett, Okla.	.65	.....	1.75	1.75	1.60	.....
Ladds, Ga.	1.75	1.75	1.75	2.00	2.00	.....
Mascot, Tenn.	.....	1.50	2.00	.....	1.50@2.00	.....
New Braunfels, Tex.	.60	1.75	1.75	1.50	1.50	1.50
WESTERN:						
Atchison, Kans.	.50	2.10	2.10	2.10	2.10	2.10
Blue Springs and Wymore, Neb.	.20	1.95	1.95	1.85@1.90	1.75@1.80	1.70
Kansas City, Mo.	.60	2.00	.....	.....	.....	.....
Duluth, Minn.	1.00	2.25	2.00	1.50	1.50	1.50

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Baltimore, Md.	1.25	2.50	2.35	2.25	2.00@2.25	2.00
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	.....
Branford, Conn.	.80	1.75	1.65	1.45	1.25	.....
Birdsboro, Pa.	1.40	1.90	1.80	1.60	1.60	1.40
Bound Brook, N. J.	2.50	2.75	2.35	2.10	2.10	.....
Dresser Jct., Wis.	.75	2.45	2.45	2.15	2.00	2.00
Duluth, Minn.	1.00	2.25	2.00	1.50	1.50	1.50
E. Summit, N. J.	2.50	3.00	2.75	2.75	2.30	.....
Glen Mills and Rock Hill, Pa.	1.70	2.35	2.05	1.90	1.95	1.80
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60@1.00	1.60@1.80	1.60@1.80	1.40@1.50	1.20@1.30	.....
Oakland, Calif.	•1.50	•1.50	•1.50	•1.50	•1.50	•1.50
San Diego, Calif.	.50@ .70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	.....
Westfield, Mass.	.60	1.35	1.30	1.20	1.10	.....
Winchester, Mass.	.85	2.10	1.85	1.60	1.60	1.60

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Baltimore, Md.—Gneiss	1.00	2.75	2.40	2.20	2.10	1.75
Dundas, Ont.—Flint	1.10	1.10	1.10	1.10	1.10	1.10
W. Barre, Pa.—Quartzite	.90	1.70	1.55	1.20	1.20	1.10
Holton, Ga.—Granite	.40	.....	2.75	2.50	2.25	2.25
Little Falls, N. Y.—Syenite	1.40	1.80	1.70	1.60	1.60	1.50
Los Angeles, Cal.—Granite	.....	1.25@1.50	1.15@1.40	1.15@1.40	.....	.....
Middlebrook, Mo.—Granite	4.00	.....	2.00	2.00	.....	1.50‡
Ottawa, Can.—Granite	5.50	5.00	5.50	5.00	.....	.....
Stockbridge, Ga.—Granite	.50	2.00	1.90	1.75	1.75	.....
White Haven, Pa.—Sandstone	1.20	2.00	2.00	1.70	1.70	1.70

•Cubic yard. †Agrl. lime. ‖R. R. ballast. §Flux ‡Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:

Coldwater, N. Y.—Analysis, 56.77% $CaCo_3$, 41.74% $MgCo_3$ — 70% thru 200-mesh, 95% thru 40-mesh; bags, $5.00; bulk 3.25

Chaumont, N. Y.—Analysis: $CaCo_3$, 95%; $MgCo_3$, 1.14% — Thru 100 mesh); sacks, 4.50; bulk 2.75

Gasport, N. Y.—90% thru 50 mesh, bulk, 2.50; bags 4.25

Grove City, Pa. — Analysis: $CaCo_3$, 94.75%; $MgCo_3$, 1.20%—(70% thru 100 mesh); 80 lb. ppr., 5.50; bulk 4.50

Grove, Md. — (50% thru 50 mesh); paper bags, 6.50; bulk 4.50

Hillsville, Pa.—Analysis, $CaCo_3$, 96% (70% thru 100 mesh); sacks, 5.00; bulk 3.25

Jamesville, N. Y.—Analysis, $CaCo_3$, 89.25%; $MgCo_3$, 5.25%; bulk, 2.75; sacks 4.50

Syracuse, N. Y. — Analysis, 90% carbonates (50% thru 100 mesh, 90% thru 50 mesh); sacks, 3.50; bulk 2.75

Walford, Pa. (50% thru 100 mesh; 60% thru 50; 100% thru 10); sacked, 5.00; bulk 3.25

West Stockbridge, Mass., Danbury, Conn., No. Pownal, Vt. — Analysis: Combined carbonate, 95%—33% thru 200 mesh; 66% thru 100; 100% thru 40. Bulk 3.25

Williamsport, Pa. — Analysis, $CaCo_3$, 88-90%; $MgCo_3$, 3-4%—(50% thru 50 mesh); bulk ..... 4.00@5.50

CENTRAL:

Alden, Ia.—Analysis, $CaCo_3$, 99.16% ..... .80

Alton, Ill. — Analysis: $CaCo_3$, 96%; $MgCo_3$, 0.75%—50% thru 4 mesh 4.50

Pulverized limestone 2.00

Bedford, Ind.—(90% thru 100 mesh) Analysis, $CaCo_3$, equivalent 98.5% ..... 1.60@2.00

Belleville, Ont.—Analysis, $CaCo_3$, 90.9%; $MgCo_3$, 1.15% (45 to 50% thru 100 mesh; 61 to 70% thru 50 mesh); bulk 2.50

Chicago, Ill.—Analysis, $CaCo_3$, 53.63%; $MgCo_3$, 37.51%—90% thru 50 mesh 1.50

Columbia, Ill., near East St. Louis (¼-in. down) ..... 1.25@1.80

Detroit, Mich.—Analysis: 88% $CaCo_3$, 7% $MgCo_3$, 75% thru 200 mesh, 2.50 @4.75; 60% thru 100 mesh ..... 1.80@4.25

Elmhurst, Ill. — (Analysis, $CaCo_3$, 35.73%; $MgCo_3$, 20.69%) 50% thru 50 mesh 1.25

Greencastle, Ind.—(Analysis $CaCo_3$, 98%), 50% thru 50 mesh 2.00

Howenstein, O.—100% thru 10 mesh; 59% thru 50; 39% thru 100 ..... 2.75@3.00

Lannon, Wis.—(90% thru 50 mesh) Analysis, 54%, $CaCo_3$; 44%, $MgCo_3$ 2.00

Marblehead, O. — (Analysis: $CaCo_3$, 95.33%) 100% thru 100 mesh, sacks, 5.25; bulk 3.00

Mayville, Wis. — $CaCo_3$, 53.65%; $MgCo_3$, 43.72% ..... 1.75@2.00

McCook, Ill.—Analysis, $CaCo_3$, 54.10%; $MgCo_3$, 45.04% — 100% thru ¼-in. sieve; 78.12% thru No. 10; 53.29% thru No. 20; 38.14% thru No. 30; 34.86% thru No. 50; 22% thru 100 ..... 1.50

Milltown, Ind. — (Analysis, $CaCo_3$, 94.41%; $MgCo_3$, 2.95%); 28% thru 100 mesh; 25.2% thru 200 mesh; 34.4% thru 50 mesh 1.65

Montrose, Ia.—(90% thru 100 mesh).

Piqua, O. — Analysis: $CaCo_3$, 82.8%; $MgCo_3$, 8.2%; neutralizing power in terms of calcium carbonate, 95.3%— 50% thru 100 mesh ..... 3.50@5.50

50% thru 50 mesh ..... 1.75@2.00

Ridgeville, Ind.—(Analysis $CaCo_3$, 98%), 100% thru 4 mesh 1.75

River Rouge, Mich.—Analysis: $CaCo_3$, 54%; $MgCo_3$, 40%; bulk ..... .80@1.40

Stolle, Ill. (near East St. Louis on I. C. R. R.)—(Thru ½-in. mesh) Analysis, $CaCo_3$, 89.61 to 89.91%; $MgCo_3$, 3.82% 2.75

Stone City, Ia.—Analysis, $CaCo_3$, 98% (50% thru 100 mesh) ..... .80

Toledo, O.—Analysis, $CaCo_3$, 52.72%; $MgCo_3$, 43%—(20% thru 100 mesh); 30% thru 50; 80% thru 100; 100% thru 5/32 screen) 1.80

Whitehill, Ill. — Analysis, $CaCo_3$, 97.12%; $MgCo_3$, 2.50%— 50% thru 100 mesh 5.00

50% thru 50 mesh 2.25

(Continued on next page.)

Agricultural Limestone

(Continued from preceding page.)

SOUTHERN:

Cartersville, Ga.—Analysis: 96% combined carbonates—pulverized limestone 2.75

Claremont, Va. (Marlime)—Analysis, 90.94% $CaCo_3$, 0.31% P., 1.36% Mg., 0.37% K.; bulk 4.50

100 lb. ppr. bags 6.00

100 lb. cloth bags 6.50

Dittlinger, Tex.—Analysis, $CaCo_3$, 99.09%; $MgCo_3$, .04%—

90% thru 100 mesh 2.00

90% thru 4 mesh 1.00

Grovania, Ga.—Analysis, $CaCo_3$, 95%; $MgCo_3$, none—50% thru 100 mesh 2.50

Hopkinsville, Ky.—Analysis, 94.6 to 98.1% $CaCo_3$—Bulk 2.00

Knoxville, Tenn.—Pulverized 2.50

90% thru 100 mesh 3.00

Ladds, Ga.—Pulverized limestone 2.50

Linnville Falls, N. C.—Analysis, $CaCo_3$, 53%; $MgCo_3$, 42%—50% thru 100 mesh; sacks, 4.50; bulk 3.00

Marion, Va.—Analysis, 90% $CaCo_3$—(50% thru 100 mesh) 2.50

Memphis Jct., Ky.—(Analysis, $CaCo_3$, 95.31%; $MgCo_3$, 1.12%); average price, ½ in. down 2.00

Mascot, Tenn.—Analysis, $CaCo_3$, 52%; $MgCo_3$, 38%.

(80% thru 100 mesh) 3.00

(All thru 10 mesh) 2.50

(80% thru 200 mesh) 5.00

Paper bags, $1.50 extra per ton; burlap, 2.00 extra per ton.

Maxwell, Va. 2.50

Mountville, Va.—Analysis, $CaCo_3$ 76.6%; $MgCo_3$, 22.83%—100% thru 20 mesh; 100 lb. ppr., 7.00; bulk 5.50

Ocala, Fla.—Analysis, $CaCo_3$, 98%—(75% thru 200 mesh) 4.50

Tyrone, Ky.—Analysis, $CaCo_3$, 90%; $MgCo_3$, 4%—90% thru 4 mesh ..... 1.75@2.25

WESTERN:

Cement, Calif.—Analysis, $CaCo_3$, 95%; $MgCo_3$, 2%—(50% thru 50 mesh) 5.00

Colton, Calif.—Analysis: $CaCo_3$, 95%; $MgCo_3$, 1½% (all to pass 14 mesh)—bulk, 3.50; bags 4.50

Sacks, 15c extra, returnable.

Kansas City, Mo., Corrigan Sid'g—50% thru 50 mesh; bulk 2.00

Oro Grande, Calif.—Analysis: $CaCo_3$, 94%; $MgCo_3$, 2%; 85% thru 200 mesh; $4.00, bulk; bags 10.25

Terminus, Calif.—Analysis, 96.4% $CaCo_3$, 1.3% $MgCo_3$—(60% thru 200 mesh; 80% thru 100 mesh; 100% thru 50 mesh); sacks, 6.00; bulk 5.25

Tulsa, Okla.—90% thru 4 mesh ..... .65

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Berkeley Springs, W. Va. 2.75

Bridgeton, N. J.—Washed, 2.50; dried 3.00

Cedarville and South Vineland, N. J. ..... 1.25@3.00

Columbus, Ohio ..... 2.50@3.00

Gray Summit, Mo. ..... 2.50@4.00

Hancock, Md.—Damp 2.00

Klondike and Pacific, Mo. ..... 2.50@4.00

Leesburg, Pa.—Core, and molding coarse 3.00

Mapleton, Pa.—Dry 4.00

Glass, damp 3.00

Massillon, Ohio 3.50

Millington, Ill. ..... 2.25@3.00

Mineral Ridge, Ohio 4.00

Montoursville, Pa.—Green, washed ..... 2.00@2.75

Morgantown, W. Va. ..... 3.00@3.25

Oregon, Ill.—Large contracts ..... 2.00@2.75

Ottawa, Ill. 2.50

Pittsburgh, Pa.—Dry, 4.00; damp 3.00

Robinson, Md.—Washed, damp 2.00

Rockwood, Mich. ..... 3.00@4.00

Round Top, Md.—Glass and damp, $2.50; core 2.25

St. Marys, Pa.—Green 3.00

Sands, Elk Co., Pa.—Selected, green 2.75

Thayers, W. Va.—Washed 3.00

Tygarty, Ky.—Washed, not dried 2.60

Utica, Ill. ..... 1.75@2.50

Ableman, Wis.—Brass molding and molding fine 3.00

FOUNDRY SAND:

Albany, N. Y.—

Molding, fine and coarse ..... 3.00@3.50

Brass molding ..... 3.00@4.00

Core 2.00

Sand blast ..... 6.00@8.00

Allentown, Pa.—Core ..... 1.75@2.00

Molding coarse ..... 1.75@2.00

Arenzville, Ill.—Molding fine ..... 1.70@1.90

Beach City, Ohio—Core and glass sand ..... 2.25@2.50

Furnace lining ..... 2.50@3.00

Molding fine and coarse ..... 2.25@2.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge, South Heights, Pa.		**1.30**		**1.30**	**1.00**	**1.00**
Attica, N. Y.	**.75**	**.75**	**.75**	**1.00**	**1.00**	**1.00**
Erie, Pa.		1.00	1.15		1.25	
Farmingdale, N. J.	.48	.48			1.40	
Hartford, Conn.	**.90**		1.25	1.15	1.15	1.15
Leeds Junction, Me.		.60@ .75	2.00	1.75	1.65	1.50
Ludlow, Mass.	**.75***	**.75***	1.70		**1.50***	**1.50***
Pittsburgh, Pa.		**1.30@1.50**			**1.00**	**1.00**
Washington, D. C.	**.75**	**.75**	2.00	1.40	**1.20**	**1.20**
York, Pa.		1.10@1.30	(crushed gravel)			
CENTRAL:						
Alton, Ill.		.85				
Attica and Covington, Ind.	.90	.90	.90	1.00	1.00	1.00
Barton, Wis.		.70		.80	.80	.80
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, O., and vicinity	1.20	1.15	1.15	1.15	1.15	2.00
Columbus, O.		.90	.90	.90	.90	.85
Des, Moines, Ia.	1.00	.75	1.60	1.60	1.60	1.60
		25% gravel, 1.00; 50% gravel, 1.20				
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Earlestead (Flint), Mich.	.70	60-40 sieves, .85; Pebbles, .95				
Eau Claire, Wis.	.40@ .50	.50@ .70	1.00@1.25		1.00@1.10	1.00@1.10
Elgin, Ill.		.80	1.00	.80	.80	.80
Elkhart Lake, Wis.	.65	.57	1.00	.77	.77	
Grand Rapids, Mich.		.60		.90	.85	.85
Greenville, Mechanicsburg, O.	.80	.70	.80	1.00	.85	.80
Humboldt, Ia.	1.00	.85	1.90	1.90	1.90	1.90
Indianapolis, Ind.	**.60**	**.60**		1.50	.75	.75
Janesville, Wis.		.65@ .95			.75@ .95	
Le Mars, and Doon, Ia.		.90		1.80		
Lincoln, Neb.	Sand .80, sand and gravel 1.30, drained for shipment					
Mason City, Ia.	.90	.80	1.90	1.80	1.70	1.65
Milwaukee, Wis.	1.55	1.55	1.60	1.60	1.60	1.60
Minneapolis, Minn.	.50	.50	2.00	2.00	1.75	1.50
Moline, Ill.	**1.30**	**1.30**	**1.60**	**1.60**	**1.60**	**1.60**
Pittsburgh, Pa.		1.30	1.30		1.00	1.00
Riton, Wis.		.85				.85@1.00
St. Louis, Mo., f. o. b. cars	1.95	1.65	1.85	1.65	1.60	1.60
Summit Grove, Clinton, Ind.	.90	.90	.90	1.00	1.00	1.00
Terre Haute, Ind.	1.00	1.00	1.25	1.25	1.25	1.25
Toledo, Ohio	**.75**	**.75**				
Yorkville, Moronts, Oregon and Sheridan, Ill.	**.90**	**.90**	**.90**	**.90**	**.90**	**.85**
SOUTHERN:						
Alexandria, La.		.90				1.65@1.85
Charleston, W. Va.	Sand 1.40@1.50—Gravel 1.50					
Flomaton, Ala.		1.00		2.25		
Ft. Worth, Tex.	2.00@2.25*	2.00@2.25*	2.75@3.00*	2.75@3.00*	2.75@3.00*	
Greenville, Miss.		1.10				1.00
Jedburg, Mo.		1.05	1.20@1.45	1.00	1.00	.95
Knoxville, Tenn.	1.15	1.15	1.60	1.60	1.60	1.40
Lake Weir, Fla.		**.75**				
Macon, Ga.		.75@1.00				
Memphis, Tenn.	1.40	1.40	1.50			1.50
N. Martinsville, W. Va.		1.40				1.20
New Orleans, La.	1.00		1.75		1.25	
Pelzer, S. C.	**.90**					
Pine Bluff, Ark.	1.25	.92	Washed gravel, all sizes, 2.10			
Roseland, La.		.60	1.40			
Tulsa, Okla.		.70				
Waco, Texas	.70@ .80	.70@ .80				
WESTERN:						
Denver, Colo.	.50*					
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton, Missouri River, .85)					
Niles, Calif.	1.00	1.00	.90@1.10	.85@1.00	.85@1.00	.85@1.00
Porteau, B. C.	1.30	1.30	1.30			1.20
Pueblo, Colo.	.95	.90				2.00
Roseburg, Ore.	2.00	1.75	2.00	1.75	1.75	1.75
San Diego, Calif.	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.25@1.45	1.10@1.40
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.25	1.25	2.00	1.25	1.25	1.25

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Glenville, N. Y.				1.00*		
Hartford, Conn.		1.00*				
Yardville, N. J.		.50@ .75				
York, Pa.		1.00@1.30		(crushed rock sand)		
CENTRAL:						
Attica, Covington, Silverwood, Ind., and Palestine, Ill.	.75	.75	.75	.75	.75	.75
Cherokee, Hawarden, Ia.		.80 per ton—1.20 washed				
Detroit, Mich.	1.10*					
Elkhart Lake, Wis.		.80 per ton (washed concrete material)				
Ft. Jefferson, Mechanicsb'g, O.	**.70**	**.60**	**.60**			
Hersey, Mich.		.60	.60	.60	.60	
Janesville, Wis.		.65			.75	
Saginaw, Mich., f. o. b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo., f. o. b. cars						1.75
Summit Grove, Ind.	**.65**	**.65**	**.65**	**.65**	**.65**	**.65**
Yorkville, Oregon, Moronts and Sheridan, Ill.						.80@ .90
SOUTHERN:						
Albany, Ga.	.70@1.00					
Dudley, Ky. (Crushed Sand)		1.15		1.10		
Lindsay, Tex.					.60	
Valde Rouge, La.						.60@ .75
Waco, Texas		.80		1.50		1.30
WESTERN:						
Saratoga, San Jose, Calif.		.60@ .75	.60@ .70	.60@ .70	.60@ .70	.60@ .70

*Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Bethlehem and Emaus, Pa.	**2.50**	**.90**	**1.50**	**1.20**	**1.20**	**1.20**	**1.20**
Buffalo, N. Y.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	3.50	1.10	1.10	1.35	1.25	1.25	1.25
Eastern Pennsylvania and Northern New Jersey	**2.50**	**.90**	**1.50**	**1.10@1.25**	**1.10@1.25**	**1.10@1.25**	**1.10@1.25**
Erie, Pa.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
Hokendaugua and Donaghmore, Pa.	**2.50**	**.90**	**1.50**	**1.20**	**1.20**	**1.20**	**1.20**
Lebanon, Pa.	**2.50**	**.85**	**1.50**	**.85**	**.85**	**.85**	**.85**
Sharpsville and Struthers, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	**2.50**	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**	**1.25**
CENTRAL:							
Chicago, Ill.			All sizes, $1.50, F. O. B. Chicago				
Detroit, Mich.			All sizes, 1.65, F. O. B. Detroit				
Ironton, Jackson, O.	**2.00**	**1.40**	**1.70**	**1.40**	**1.40**	**1.40**	**1.40**
Toledo, O.	2.20	1.70	1.95	1.95	1.95	1.70	1.70
Youngstown, Dover, Hubbard and Leetonia, O.	**2.00**	**1.30**	**1.70**	**1.30**	**1.30**	**1.30**	**1.30**
SOUTHERN:							
Alabama City, Ala.	2.05	1.00	1.25	1.25	1.25	1.00	.95
Ensley, Ala.	**2.05**	**1.00**	**1.25**	**1.25**	**1.25**	**1.00**	**.95**
Longdale, Goshen, Glen Wilton and Low Moor, Va.	**2.50**	**1.00**		**1.25**	**1.25**	**1.15**	**1.05**

Agricultural Lime and Hydrate

	—Agricultural Lime— Bulk	Bags	Per Cent CaO	Per Cent MgO	Agricultural Hydrate Bags
EASTERN:					
Adams, Mass.		7.50@8.00	72		
Bellefonte, Pa.	9.50		95.6		
Berkeley, R. I.			**50**	**18**	**15.00**
Branchton, Pa.		5.50			
Cassadaga, N. Y.—Marlime	8.00		48.07	1.08	
Cavetown, Md.	**8.50**				
Cedar Hollow, Devault, Rambo and Swedeland, Pa.	10.50		45.50	30.50	13.00
Chippewa, Pa.	6.00		78.67	1.33	
Farnams, Mass.	5.00	6.50	60	2	
Frederick, Md.	**7.75**		**88**	**5 to 8**	**10.50**
Grove, Md.	**8.00**				**10.75**
Highgate Springs, Vt.	**6.00**		**85**	**2**	**8.00**
Hyndman, Pa.	**5.00**	**8.50**	**80.23**	**2.87**	
Lime Ridge, Pa.	**5.25@6.50**		**80.56-62.56**	**3.87-1.75**	
Mt. Union, Pa.	6.25		93.69		
Newburgh, N. Y.			**57**	**38**	**8.00**
New Castle, Pa.	**3.50**	**4.50**	**47.6 to 50.4**	**0.62 to 1.12**	
Paxtang and Lemoyne, Pa.	5.00@6.00		60	3	
Rosendale, N. Y.	**8.00**	**9.00**	**92**	**5**	
Union Bridge, Md.	**11.00**	**5.50**	**73**	**1**	**13.00**
Williamsport, Pa.	6.25	12.00	84-87	2-3	12.00
West Rutland, Vt.	**5.00**	**8.00**	**68**	**3**	
West Stockbridge, Mass.	**3.35**	**5.35**			**12.00**
Williams and Blue Bell, Pa.		8.25	57	33	11.25
York, Pa.	9.50	13.00	92.5	3.5	11.75
CENTRAL:					
Alton and Hannibal, Ill.	**11.50**		**.95**		
Delaware, O.			50.0	5-12	11.10
Knowles and Valders, Wis.	5.00	9.00	55	45	12.50
Manistique, Mich.	**11.00**		**95**	**2**	**11.00**
Marblehead, O.			85.10	12.92	12.00
Mitchell, Ind.					12.50
Sheboygan, Wis.	**5.50**	**8.50**	**58**	**40.5**	
Woodville, Ohio			47.50	31.60	8.00@12.00
SOUTHERN:					
Blowers, Fla.	3.25		98		
Burns, Tenn.	9.50		96	0.54	12.00
Chippewa, Fla.	**5.00**		**80.0**	**15.0**	
Claremont, Va. (Marl.)	5.00	7.00	85-95	2-5	
Dittlinger, Texas		**9.00@11.00**	**98.62**	**0.29**	**12.50@15.00**
Erin, Tenn.	10.00		97.82	0.12	
Knoxville, Tenn.	10.00		98.4	1	13.00
Lushing, Va.	**9.00**	**11.25**	**60**	**15**	**12.75**
Maxwell, Va.	**6.50**		**84**		**6.50**
Newala, Ala.	**10.00**		**99.33**		
Ocala, Fla.	**4.00**	**6.00 pulv.**	**98½ (dry basis)**		
Staunton, Va.	8.00	10.50	85	10	
WESTERN:					
Colton, Calif.			**97**	**2**	**15.00**
Kirtland, N. Mex.	12.50				
San Francisco, Calif.		15.00	97	0.33	15.00
Tehachapi, Cal.	6.00	8.00	96	2	
Orofino, Idaho	6.50	8.57	95	2.16	

Miscellaneous Sands

(Continued from preceding page)

Bowmantown, Pa.—Core	**1.35@1.50**
Molding, coarse	1.80@2.00
Bridgeton, N. J.—Core	**2.00**
Cleveland, O.—Molding coarse	**1.50@2.00**
Brass molding	**1.50@2.00**
Molding fine	**1.50@2.00**
Core	**1.25@1.50**
Columbus, O.—Core	**1.00@3.00**
Brass molding	**3.50@4.00**
Glass sand	**3.00**
Molding fine and coarse	**3.00**
Conneaut, O.—Molding fine	**2.25@2.50**
Molding coarse	**2.00@2.25**
Delaware, N. J.—Molding fine	**2.00**
Molding, coarse	**1.90**
Brass Molding	**2.15**
Dresden, O.—Core	**1.75**
Molding fine and coarse	2.00
Brass molding	2.50
Eau Claire, Wis.—Core	1.00@1.25
Roofing gravel	1.00@1.25
Sand blast	3.00@4.25
Traction sand	.40@ .60
Fleetwood, Pa.—Furnace lining	**2.25**
Franklin, Pa.—Traction	**2.25**
Brass molding	**2.50**
Core	**3.00**
Molding fine	**3.00**
Molding coarse	**3.00**
Sand blast	**5.00**
Greenville, Ill.—Molding coarse	1.80@2.00
Hancock, Md.—Core and brass mldg.	**1.65**
Hellam, Pa.—Core	**2.00@2.50**
Joplin, Mo.—Stone sawing, flint	**1.25**
Kansas City, Mo.—Missouri River core	**.80**
Klondike and Gray Summit, Mo.—Molding fine	**2.00@3.00**
Mapleton, Pa.—Core, furnace lining, molding fine and coarse damp	**2.50**
Core, furnace lining, moulding, fine and coarse, dry	**3.00**
Massillon, O.—Molding fine	**4.00**
Core and molding, coarse	**3.50**
Glass sand	**4.00**
Traction	**3.50**
Furnace lining	**4.00**
Michigan City, Ind.—Core, bank	**.75**
Millington, Ill.—Glass and core	**2.25**
Core sand	**2.25**
Furnace lining	**2.50**
Roofing sand	**2.25**
Stone sawing	**2.25**
Mineral Ridge, O.—Core, molding, sand blast, roofing, etc., washed, screened (damp)	**3.25**
Montoursville, Pa.—Core and traction	**1.50@2.00**
Brass molding	**1.75@2.25**
Glass sand	**2.00@2.75**
New Lexington, O.—Molding fine	3.50
Molding coarse	3.25
Oregon, Ill.—Core sand	3.00
Potter's flint	9.50
Steel molding	1.25
Plasters' molding	2.50
Sand blast	2.25@2.75
Placing sand	3.50
Ottawa, Ill.—Crude silica sand	**1.25@1.75**
Ottawa, Ill.—Core, furnace lining, steel molding	2.50
Sand blast	5.00
Glass sand	2.00@2.50
Roofing sand	2.50@5.00
Ridgeway, Pa.—Glass sand, green	**2.25**
Glass sand, wash	**2.50**
Molding, fine and coarse	**1.20**
St. Peter, Minn.—Glass sand	**2.25**
Core sand	**2.25**
Brass molding	**2.25**
Molding fine	**2.25**
Rockwood, Mich. — Glass sand, core, roofing, stone sawing	**3.50@4.00**
Sand blast	**3.50@4.00**
Thayer, Pa.—Traction	**2.25**
Furnace lining	**1.40**
Molding fine and coarse	**1.25@1.50**
Core, steel	**2.50@3.00**
Tygarty, Ky.—Core and stone sawing	**2.60**
Fire-brick sand, washed but not dried	**2.15@2.40**
Utica, Pa.—Core	**3.00**
Molding fine	**3.00**
Molding coarse, traction	**3.00**
Brass molding	**3.00**
Warwick, Ohio—Core, furnace lining, molding fine and coarse (dry)	**2.75**
Same, green	**2.50**
Wedron, Ill.—Core (crude silica)	**1.25**
Molding fine	**1.50**
Furnace lining	**1.50**
West Albany, N. Y.—Molding fine	**2.50**
Molding coarse	**2.50**
Brass molding	**2.50**
Winnipeg, Man., Can.—Roofing sand	*4.00
Zanesville, Ohio—Molding fine and brass	**2.50@3.00**
Molding coarse	**2.25@2.50**

Crushed Gypsum

Blue Rapids, Kan.—Crushed	3.50
Castalia, O.—Crushed, to cement mills	3.50
Ft. Dodge, Ia.—Bulk	3.50
Grand Rapids, Mich.—Crushed gypsum rock	3.50
Gypsumville, Man., Can.—Crushed	**3.50**
Oakfield, N. Y.	**4.00**
Gypsum, O.	3.50
Port Clinton, O.—Crushed gypsum	3.50
Saltville, Va.	**4.50**

(Gypsum) Land Plaster

Castalia, O.—Land plaster	5.50
Bags extra—Jute, 3.00; ppr., 1.00.	
Garhutt, N. Y.—Land plaster, bags	7.50
Bags extra	
Grand Rapids, Mich.—Ground gypsum rock	4.50
Mound House, Nev.—Ground gypsum rock	**7.50@8.00**
Sacks, .25 extra	
Oakfield, N. Y.—Ground Gypsum rock	**8.00**
Plasterco, Tex.	12.00
Sandusky, O.	**6.00**
Jute, 3.00 extra; ppr., 1.00 extra.	
Los Angeles, Calif.	12.50
Winnipeg, Man., Can.—Ground gypsum rock	4.50@5.00

Ground Rock Phosphate

Centerville, Tenn.—B. P. L., 70%; ton, 2000 lbs. (90% thru 100 mesh)	**9.00@10.00**
Lump rock, 72% to 75%, B. P. L.	**6.00@8.50**
Centerville, Tenn.—B. P. L., 65%	8.00
B. P. L., 70%	**9.00@10.00**
Brown rock, 75% and better	**12.00**
Gordonsburg, Tenn.—2000 lbs. (90% thru 100 mesh)—B. P. L., 60%	**6.00**
B. P. L., 65%	7.50@9.50
B. P. L., 68%	700@8.00
B. P. L., 72%	9.50
B. P. L., 75%	12.00
Lump rock, long ton, 65-70%	**7.00@9.00**

(Continued on next page)

Ground Rock Phosphate

(Continued from preceding page)

Mt. Pleasant, Tenn.—(B. P. L. 68%)
13% phosphorus ..... 7.50@9.00
14% phosphorus **8.00**
Mt. Pleasant, Tenn.—B. P. L., 65-70% ..... 7.00@8.50
Norwills, Fla.—Fla. Hard Rock (B. P. L., 68%) **10.00**
Wales, Tenn.—(B. P. L., 70%) 8.25

Florida Soft Phosphate

Bartow, Fla.—B. P. L., 60%, bulk 10.00
Croon, Fla.—Ground pebble, 30% **16.00**
Pulverized soft, 26% **17.50**
Jacksonville (Fla.) District ..... **10.00@12.00**
(Add 2.50 for sacks)
Norwills, Fla.—B. P. L., 60%, bulk 10.00
Phoslime, Fla. (in burlap bags) **15.00**
Morriston, Fla. (24% phosphoric acid) 16.00
Lakeland, Fla. (N. B. P. L.) 13.50

Portland Cement

Current warehouse prices, carload lots at principal cities, without bags:

New York (del.) $3.10
Jersey City (del.) 2.89
Boston 3.41
Chicago 2.37
Pittsburgh 2.42
Cleveland 2.73
Detroit **2.78**
Indianapolis 2.61
Toledo 2.71
Milwaukee 2.59
Duluth 2.35
Peoria 2.63
Cedar Rapids 2.71
Davenport **2.67**
St. Louis 3.45
San Francisco 3.09
New Orleans 3.76
Minneapolis 3.00
Denver 3.25
Kansas City 2.76
Seattle 3.10
Dallas 2.85
Atlanta 3.00
Cincinnati **3.32**
Los Angeles 3.21
Baltimore (del.) 2.93
Montreal (including bags) 3.52
Winnipeg (including bags) 4.28

NOTE—Bag charge is generally 25c each.

Natural Cement

Current price for 500 bbl. or over, f.o.b., exclusive of bags:

	Current
Minneapolis (Rosendale)	$2.80
Kansas City (Ft. Scott)	1.60
New Orleans	3.36
Atlanta (Magnolia)—ton	11.00
Cincinnati (Louisville)	2.75
Boston (Rosendale)	2.35

Roofing Slate

The following prices are per square (100 sq. ft.) for slate, f. o. b. cars, quarries, Bangor, Penn.

No. 1 Clear Slate

Sizes	Price
24x14	10.85
24x12	10.85
22x12	11.55
22x11	11.55
20x12	11.55
20x10	12.60
18x12	11.90
18x10	12.60
18x 9	12.60
16x12	11.90
16x10	12.60
16x 9	12.60
16x 8	12.60
14x10	11.90
14x 8	11.90
14x 7	11.20
12x10	11.20
12x 8	11.20
12x 7	11.20
12x 6	11.20
10x 8	9.10
10x 7	9.10
10x 6	9.10

No. 2 Clear

24x12	8.75
22x11	8.75
20x10	9.45
18x10	9.45
18x 9	9.45
16x 8	9.10
14x10	9.10
14x 8	9.10

No. 1 Odd Sizes

18x18	13.30
16x16	13.30
14x14	13.30
12x12	13.30

The following are the prices per square for slate, f.o.b. cars quarries, Granville, N. Y., the prices given in each case being for No. 1 Sea Green Roofing Slate:

22x11, 20x12, 20x11, 20x10, 18x12, 18x10, 18x9, 16x12, 16x10	11.90
16x12, 16x10	11.90
24x12, 22x12, 16x9, 16x8, 14x12, 14x10	11.55
26x14, 24x14, 22x14, 20x14	11.20
14x9, 14x8, 12x10	10.50
14x7, 12x9, 12x8	9.80
12x7, 11x8, 11x7, 10x8	9.10
12x6, 10x7	8.40

Granulated slate per net ton, f. o. b. quarries, Vermont and New York, 7.50@12.00.

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton	
	Finished	Common
New York	$21.00	$20.00
Kansas City	27.20	26.20
Chicago	20.00	.....
St. Louis	26.00	20.00
Boston	**28.00**	**27.00**
Dallas	.....	25.00
Cincinnati	19.50	17.60
San Francisco	25.40	22.00
Minneapolis	27.00 (white)	22.00
Denver	32.00	.....
Detroit	**22.00**	**19.00**
Seattle	27.00	.....
Los Angeles	30.00	30.00
Baltimore	24.00 (East)	.....
Montreal	25.00	.....
Atlanta	.....	18.00
New Orleans	24.50	24.50

	Lump per 200-lb. Barrel	
	Finished	Common
New York	$ 3.50 at plant	$ 3.30*
Kansas City	2.50	2.40
Chicago	.....	1.75
St. Louis	.....	4.12½*
Boston	.....	3.75†
Dallas	.....	2.50†
Cincinnati	.....	**2.10‡**
San Francisco	.....	2.25
Minneapolis	2.00	1.80
Denver	1.05 (bu.)	.....
Detroit	2.00†	1.80†
Seattle	3.25†	.....
Los Angeles	3.00*	3.00*
Baltimore	.....	13.00‡
Montreal	15.00‡	.....
Atlanta	.....	2.25†
New Orleans	2.70	2.25

*300-lb. barrels. †Per 180-lb. barrel. ‡Per ton.
NOTE—Refund of 10c per barrel with 25c per ton off on hydrated.

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Crude talc 4.00
Cubes 50.00
Blanks, per lb. ..... .07
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton ..... 3.00@ 3.25
Ground talc (20-50 mesh), bags ..... 8.50@ 9.00
Ground talc (150-200 mesh), bags ..... 11.25@13.75
Chester, Vt. — Ground talc (150-200 mesh), bulk, 10.50@12.00; bags ..... 12.00@14.00
Chatsworth, Ga.—Crude talc ..... **8.00@10.00**
Ground talc (150-200 mesh), bags **12.50**
Pencils and steel workers' crayons, **per gross** ..... **1.50@ 2.00**
Rochester and East Granville, Vt.—
Ground talc (20-50 mesh), bulk ..... 8.50@10.00
(Bags extra)
Ground talc (150-200 mesh), bulk ..... 10.00@22.00
(Bags extra)
Waterbury, Vt.—Ground talc (20-50 **mesh), bulk** **8.50**
(Bags extra)
Ground talc (150-200 mesh), bulk, **10@15.00 and** ..... **10.00@15.00**
(Bags extra)
Pencils and steel workers' crayons, per gross **2.00**
Biltmore, N. C.—Ground talc (150-200 mesh), 200-lb. bags ..... 15.00@30.00
Pencils and steel workers' crayons, per gross, 1.25@1.45 and ..... 1.55@ 1.60
School crayons, per gross ..... 1.15@ 1.20
Roller mill crayons, per gross ..... 1.75@ 1.90
Keeler, Calif.—Ground talc (150-200 mesh), bags ..... 18.00@40.00
(Bags extra)
Gouverneur, N. Y.—Crude talc 4.25
Ground talc (150-300 mesh) ..... 17.00@24.00
Johnson, Vt.—Ground talc (20-50 mesh), bulk ..... 8.50@10.00
(Bags extra)
Ground talc (150-200 mesh), bulk ..... 10.00@21.00
(Bags extra)
Los Angeles, Calif.—Ground talc (20-50 mesh) 200-lb. bags 12.00
Ground talc (150-200 mesh) 200-lb. bags 20.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags ..... 16.00@20.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Michigan City, Ind **14.00**
Milwaukee, Wis. (delivered at job) **18.50**
Barton, Wis. **15.00**
South Dayton, Ohio 16.50
Albany, Ga. 16.00
Brighton, N. Y. 20.50
Buffalo, N. Y. **16.50**
Winnipeg, Can. (less $1 trade disc.) 19.00
Boston, Mass. 19.00
Syracuse, N. Y. (delivered at job) **27.00**
F. o. b. cars, plant 25.50
Washington, D. C. **15.50**
San Antonio, Texas—Common 20.00
Face ..... 25.00@32.00
Boise, Idaho (in yard) 18.00
El Paso, Texas 15.00
Rochester, Mich. **13.00**
Bloomfield, Ont., Can. **18.00**
Plant City, Fla. **17.00**
Grand Rapids, Mich. 15.00
Lancaster, N. Y. 16.50
Portage, Wis.—Common ..... 18.00@20.00
Face ..... 30.00@35.00
Toronto, Can. 17.00
Saginaw, Mich. 17.00

Cement Brick

Prices given per 1,000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Houston, Tex.	$ 21.00	$27.00
Eau Claire, Wis.	18.00@22.00	.....
Bellow Falls, Vt.	25.00	35.00
Portland, Ore.	28.00	48.00@75.00
Fancy brick	100.00@150.00	
St. Paul, Minn.	18.00	30.00@32.00
Omaha, Neb.	29.00@32.00	40.00@45.00
Piqua, O.	20.00	25.00@30.00

Gravel Roads in Maine

HIGHWAY administration in Maine includes at least two practices which may well be studied by states whose programs do not call for extensive construction of high-type pavements, but whose highway systems demand general improvement. These two practices concern the construction of plain gravel highways and the maintenance of surface-treated gravel. Specifications to be found in most highway handbooks and, in fact, adopted by various state highway departments, which call for the bonding with clay of the top course of plain gravel roads, have been replaced in Maine by those that require the top course to be of the cleanest gravel. Instead of rolling, consolidation of the surface is skillfully avoided. In fact, a loose, or "live," surface course is deemed necessary for success. In surface treatment the economic distribution of bitumen has become an art. "Put the bituminous material only where it is needed" is an old maxim in Maine's maintenance.—"Engineering News-Record."

News of the Industry

Incorporations

Irahan & Co., Montreal, Can., manufacturers of artificial stone, has been registered.

Huntington Tile & Brick Co., Huntington, W. Va., has been incorporated for $150,000.

The Canfield Lime Co., North Canaan, Conn., has filed notice of dissolution under state laws.

De Luxe Onyx Co., Bakersfield, Calif., has been incorporated for $100,000 to engage in a general quarrying business.

William Windhorst, Inc., Olivia, Minn., has been incorporated with a capital of $50,000 to handle building material, etc.

The Alpha Mines Co., Portland, Me., has been incorporated for $2,000,000 by R. L. Johnson, H. I. Hughes and A. B. Farnham.

The Pratte Granite Co., Barre, Vt., has been incorporated for $10,000 by G. O. Pratt, A. S. Pratt and A. E. McKay, all of Barre, Vt.

The Fay Sand and Gravel Co., Chisholm, Minn., has been incorporated for $25,000 by W. E. Fay, E. F. Bailey, and G. K. Trask.

The Coal, Clay and Rock Products Co., Akron, O., has been incorporated for $1,250 by S. D. Stanson, A. T. Barnes, C. Heinicke and E. V. Maguire.

The United Sand and Gravel Co., Buffalo, N. Y., has been incorporated for $28,750 by W. and S. Szpakowski and V. Karaskiewicz, all of Buffalo.

The Marshville Pressed Stone Co., Marshville, Wis., has been incorporated for $8,000 to manufacture concrete blocks and brick by Jacob Koll and W. G. Dobberpuhl.

The Kersey-Carr Co., Greensboro, N. C., has been incorporated with a capital stock of $50,000 by J. B. Kersey, W. B. Carr and L. Herbin, to establish a rock crushing plant.

United States Asphalt Products Corp., Jersey City, N. J., has been incorporated for $1,000,000 to treat asphalt by A. R. Meyers, R. K. Thistle and R. M. Gavelt, all of New York City.

The Carpenter-Gordon Co., Elizabeth, N. J., has been incorporated for $50,000 to deal in all building materials by A. R. Carpenter, F. A. Gordon and J. J. Stamler, 207 Broad St.

The Cannon-Wiley Corp., Baltimore, Md., has been organized with a capital of $100,000 to manufacture monuments by Lucius Q. C. Lamar, Cornelius Roe and Edwin F. A. Morgan.

The Newport Sand and Gravel Corp., Rochester, N. Y., has been incorporated for $20,000 by Houston Barnard, W. A. Magruder and H. J. Emmel, all of 36 Main St., Rochester.

The Vollbrecht Cut Stone Co., Milwaukee, Wis., has been incorporated for $20,000 to deal in limestone products and general cut stone business by A. J. Vollbrecht, H. F. Biggam and W. C. Wehe.

A. B. Schiavone, Inc., New Rochelle, N. Y., has been organized with a capital of $10,000 to operate a local building supply yard. The company is headed by B. J. Fitzsimmons, M. T. and A. B. Schiavone, New Rochelle.

The Grobert Lumber and Material Co., West Allis, Wis., has been incorporated for $15,000 to deal in cement, sand, gravel, stone and other building materials. The incorporators are A. Grobert, E. Grobert, and F. S. Baldwin.

F. R. Jones & Sons, Inc., Carthage, N. Y., has been organized with a capital of $50,000 to operate a local building supply business, including masons' materials, coal, etc. The company is headed by H. L., R. H., and E. H. Jones.

The Haddon Heights Lumber Co., Haddon Heights, N J., has been incorporated for $40,000 to operate a building material yard. The company is headed by S. L. Bennett and C. D. Martin, Camden, N. J., and J. D. Barr, Haddon Heights.

The Industrial Potash Corp., capitalized at $30,000,000, has been incorporated at Salt Lake City, Utah, to exploit immense alunite deposits in mining districts near Marysvale, Utah. The construction of a plant capable of handling 10,000 tons of alunite ore per day and the expenditure of $1,000,000 in the development of the holdings is contemplated, according to Louis Grollman of Chicago.

Quarries

The Bedford-Carthage Stone Co., Tulsa, Okla., is in the market for marble-working machinery.

Eberhard Brothers, Catasauqua, Pa., have closed down their local quarry recently, throwing about 35 men out of employment. The company produces limestone and disposes of its output to local iron furnaces.

The Brainard, Shaler & Hill Quarry Co., Portland, Conn., operating large brown stone quarries, has filed notice of reduction in capital from $660,000 to $330,000. The company's plant has not been in operation for some time past and no immediate plans have been arranged for resumption.

The Outagamie Limestone Co., Blackcreek, Wis., is planning for an additional building and equipment, which will include a crushing plant, storage bins, pulverizers, motors, bucket elevators, etc. F. A. Maas, 75 30th St., Milwaukee, Wis., is president, and Dr. J. B. Huhn, of Blackcreek, is secretary and treasurer.

Cement

The Oregon Portland Cement Co., Portland, Ore., reports that the gross profits for the year just closed amounted to $158,923.83, according to a report submitted to L. C. Newlands, vice-president and general manager of the company.

The Lawrence Portland Cement Co., Northampton, Pa., held its seventeenth annual banquet at Hotel Allen, Allentown, Pa., on Jan. 21, with a total of 38 members of the organization present. Charles S. Porter acted as toastmaster, and a number of addresses were made, including remarks by J. S. Van Middleworth, secretary, and M. S. Ackerman, Jr., assistant secretary.

Sand and Gravel

The Bibble Sand Co., Chattanooga, Tenn., will make improvements and extensions in its plant to cost about $50,000, including new equipment. Richard Hardy is president.

The B. G. and L. Sand and Gravel Co., Milwaukee, Wis., has changed its name to F. A. Becker Co., also increasing its capitalization from $6,000 to $30,000. F. A. Becker is president of the company; John Goetz, vice-president, and Wm. Lietz, secretary-treasurer.

Silica Products Co., Inc., Portland, Ore., has been organized with a capital of $100,000, under the laws of the State of Oregon, and has taken over under lease and bond the immense deposits of silica sand and clay formerly owned and operated by Silica King Mines Co., of Oregon City, Ore. Upon this property are large deposits of silica sands, which, as found in the natural state, range in fineness from 80 per cent passing the 200 mesh screen to all passing the 40 mesh, 20 to 30 per cent retained upon the 80 mesh and 20 to 40 per cent passing the 200. The clays are of the same chemical composition as the sands, and each range in color from almost pure white to the lighter shades of brown and blue. A hundred ton capacity grinding and drying plant is being installed for handling the materials required to be so treated, and washing and sizing plants are being placed for treating the various sand products. The chief market for these materials, so far as tonnage is concerned, is a 200 mesh filler required for asphaltic streets and state roads. The property has been operated in a small way for the past four years, but the increased demand for the several products has prompted the installation of a plant of a larger capacity.

Retail Dealers

The Missouri Portland Cement Co., 12th floor Union and Planters Bank Bldg., Memphis, Tenn., are building a new loading and distributing station on a site of 250 acres they recently acquired on Wolf river, north of the city of Memphis. This plant will be completed about the middle of April. Screening and washing facilities will be very complete. They report sand and gravel activities quiet just at this time but spring and summer prospects bright. They will continue as before their several yards in the city. They are also extensive dealers in Portland cement and operate a fleet of dredge boats.

Louisville, Ky.—Effective Jan. 1, 1921, A. H. Fairleigh and John F. Livingston, formerly with the Louisville Builders Supply Co., and Thomas C. Small, at one time with that company, and later with the Ohio River Sand Co., took over the building supply department of the R. B. Tyler Co., Louisville, it being planned to continue the offices at 114 South Fourth St., with the warehouse plant on Levering St. It is planned to greatly increase the line of building supplies, and in addition to face brick, common brick, lime and cement, general stocks of metal goods, etc., will be handled. Heretofore the department has handled brick and specialties principally.

Personals

General Harry C. Trexler, president of the Lehigh Portland Cement Co., has been elected a director of the Lehigh Valley Railroad Co., succeeding Henry S. Brinker, retired.

Arthur H. Blanchard, M. Am. Soc. C. E., Consulting Highway and Transport Engineer, Ann Arbor, Mich., has been retained by the City of Colorado Springs in connection with its $1,200,000 paving program.

J. H. Libberton, formerly manager of the service bureau, Universal Portland Cement Co., member Technical Problems Committee, Portland Cement Association, and member Joint Committee on Standard Specifications for Concrete, has become connected with the General Chemical Co., at its offices, 25 Broad St., New York City. He will handle service and sales of Hard-N-Tyte, a chemical crystalline hardener for concrete. Mr. Libberton has been associated with the cement industry for over twelve years.

Frank D. Horton, formerly with the Carolina Portland Cement Co., of Birmingham, Ala., and for the past year connected with the Central Cement and Supply Co., of Mobile, Ala., as manager, has returned to Birmingham as local manager for the Standard Fuel and Material Co. He will have charge of the sales in the Birmingham and immediate territory adjacent. W. H. Adams, formerly with the Carolina Portland Cement Co., of Birmingham, has also joined the Standard Fuel and Material Co., as manager of the warehouse and yards at Avenue B and Sixteenth Street, South. This company distributes all kinds of rock products, sand, gravel, etc.

Manufacturers

The Hendrick Mfg. Co., 39-75 Dundaff St., Carbondale, Pa., have opened a branch office at 915-916 Union Bank Bldg., Pittsburgh, Pa. The company specializes in the manufacture of perforated metals.

The Lunkenheimer Co., Cincinnati, O., manufacturers of engineering specialties, has issued its 1920 catalog marking the fifty-eighth year of its operation. The catalog is well illustrated and contains much useful information. It should be in the hands of every producer for ready reference.

The Austin Machinery Co., 1020 Maison Blanche Bldg., New Orleans, La., announces its incorporation under the laws of the State of Louisiana, as sole distributors for Louisiana, Arkansas, Mississippi and Tennessee of the products of the Austin Machinery Corp., manufacturers of contractors' equipment.

The Philip Carey Co., Cincinnati, O., have issued catalog No. 1362 dealing with asbestos and magnesia products as applied to pipe and boiler coverings. The catalog contains much useful and instructive data on heat loss and heat insulation and should be had by every one using steam as a source of heat and power.

Arnold and Weigel, Woodville, O., contractors and engineers specializing in the design of lime calcining and hydrating plants, are publishing monthly a miniature newspaper called "Kilo-O-Grams," devoted to the interests of the lime industry. The bulletin contains items of interest relative to modern lime plant installations, besides containing some good humorous matter. The bulletin will be sent to anyone interested in the manufacture or selling of lime, or any of its by-products.

CLASSIFIED ADVERTISING

Help Wanted

WANTED

Thoroughly competent, reliable man for superintendent of mill, crushing and grading quartz. Must be able to handle men and have some knowledge of rock-crushing plants. Plant located in city limits of good sized town.

Address W. A. C., ROCK PRODUCTS

WANTED

Superintendent of sand and gravel quarry in New England, thoroughly familiar with operation and upkeep, two steam shovels, one locomotive, cars, belt conveyors, etc. Plant practically complete. Capacity around 100 yards per hour. Address

Box 1464 **Care Rock Products**

WANTED

Thoroughly competent, reliable, hustling, sober superintendent for manufacturing extra fine stone, brick and cut glass. Substantial reference required.

M. L. T. **Care of Rock Products**

WANTED

A practical quarry man, with some capital, to superintend a quarry located two miles west of Milwaukee, having a market within a radius of seven miles for all we can produce, delivered by trucks; also have railroad connections. A good proposition for the right man. Address

Box 1467 **Care Rock Products**

Position Wanted

POSITION WANTED

Superintendent desires engagement; crushing plant; 20 years' experience in steam-shovel production; thorough knowledge of details and can produce results; excellent references; salary and tonnage basis only considered. Address

Box 1462 **Care of Rock Products**

WANTED

A position as superintendent of crushing and screening plant, stone, sand, slag or gravel; A-1 reference.

Box 1466 **Rock Products**

Help Wanted

ATTENTION
Road Building Contractors

Reliable engineer with 30 years' experience in the construction, development and operation of stone-crushing plants is desirous of getting in touch with contractors building good roads where haul from quarry to site of road being constructed is long. Competent to submit cost of stone on board cars or trucks and will build and operate plant on a royalty basis or furnish all material and deliver stone on board cars or trucks for a contract price. A1 references.

Box 1468 **Rock Products**

Old established eastern manufacturing company desires to increase their manufacturing activities and is looking for a patented machine or specialty to manufacture. Prefer something closely allied to the Cement, Rock Crushing or Fertilizer Industry. Give complete particulars with first communication. Address

Box 1455 **Care of Rock Products**

Plant for Sale

FOR SALE

A Plant producing Lime, Sand-Lime Brick, and Sand and Gravel. 50 acres in fee simple, with a 100 ft. deep deposit for the best Lime Rock. A first-class opportunity for crushed-rock business. Practically exclusive territory for entire output of plant. Continuous operations. Will sell Sand-Lime Brick machinery separate. Very low price quoted on this Plant. For full particulars, write

G. N. WYCKOFF, Dudley, Kentucky

Plants for Sale

FOR SALE

Limestone Quarry located 40 miles west of Albany, N. Y., on main line of Delaware and Hudson Railroad.

Unlimited quantity of limestone available. Between 50,000 and 60,000 yards already quarried, of which large part is ready for crusher. Very little stripping required in quarry.

Three boilers, two steam hoisters and rails suitable for switches are also available.

A fine proposition for crushing plant or cement manufacturing. Address

A. B. RYDER
BARNERVILLE, N. Y.

FLUORSPAR MINE

In Western Kentucky. 80 acres fee. Large proved ore bodies. Systematically developed and modernly equipped. Present output capacity, 50 tons daily, which can be increased, as desired, with increased development. Individual owner has invested his resources in acquiring, developing and equipping, and the present general business depression has caused shutdown. Future work will necessitate obtaining operating capital, for which an interest in the property is offered; or an outright sale, at a sacrifice, would be made. Fluorspar mining is an essential industry, and highly remunerative. Property will bear rigid examination. Address

P. O. Box 111, Marion, Kentucky

FOR SALE

Crushing and Pulverized stone plant consisting of about 30 acres of stone land with No. 5½ Gates Crusher and No. 3 Gates Crusher and one Sturtevant Pulverizer with all necessary machinery and equipment, including 100 horsepower boiler and engine; all machinery in A-1 condition. Pulverized limestone for agricultural purposes one of the main industries. Buildings all new. Shipping facilities splendid.

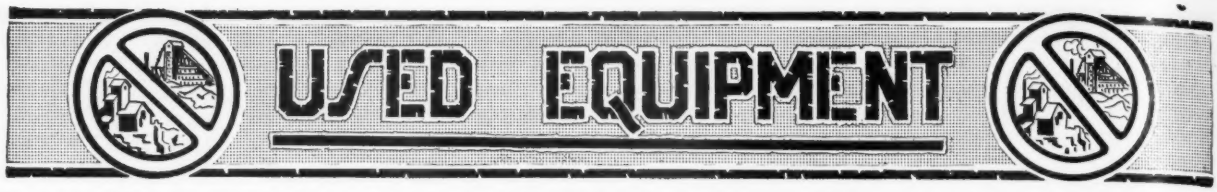
Call on or address

Hamilton Brothers, Bellefontaine, Ohio

FOR SALE

A first-class washed Sand and Gravel Pit, an A-1 proposition with AA-1 location, at purchaser's price.

Southern Illinois Sand and Gravel Co.
Marion, Illinois



Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

Repaired Contractors' Equipment

Steam Shovels

Model 60 Marion Shovels, 2½-yard dippers, Nos. 1999, 2059, 2130

1—Model 1 Thew, on railroad trucks, ⅞-yard dipper.

1—Bucyrus Model 70-C, Shop No. 1219.

We have a large stock of thoroughly repaired Construction Equipment of all kinds ready for immediate shipment.

Locomotives

8—18-ton, 10x16" Porter Dinkeys, 36" gauge.
2—12-ton, 9x14" Porter Dinkeys, 36" gauge.
1—17x24", 55-ton, 4-6-0, standard gauge.
3—25-ton Forney type.

Clam Shell Buckets

1—1¼-yard Williams Hercules Bucket.

Cars

30—Western Air Dump 12-yard, standard gauge.
40—Western 4-yard, 36" gauge, steel beam.

H. KLEINHANS COMPANY
Union Arcade **Pittsburgh, Pa.**

Equipment for Sale

Sauerman Dragline Excavator Outfit Complete, Including

1—100-ft. Lattice Steel Tower.
1—1½-yd. Bucket and Carrier, with extra new bottom; never been used.
900 ft. 1⅜ Track Cable, good condition.
850 ft. ¾ Hauling Cable in good condition.
1—Thomas Elevator Co. Double Drum Two Speed Hoisting Engine.
1—100-H.P. Alternating Current Motor.

All in good working condition. Hoisting Engine practically good as new. Located in Erie, Pennsylvania. For particulars, address

DOWNING GRAVEL PIT
1117 State Street **Erie, Pennsylvania**

WANTED

1—12x12 air compressor.
1—1 hammer air compressor.
1—18" disc crusher.
1—1 bag batch concrete mixer.
Must be in A1 condition.

FOR SALE

1—1½-yard cableway excavator, complete, in good condition, including bucket, mast fittings, cable, hoist.

KAMPESKA MATERIALS CO.
Watertown, South Dakota

FOR SALE

15-in. Morris Sand Pump; Rand Drill Company No. 10 Imperial Type Compressor; low pressure cylinder 10 x 12, high pressure 5½ x 12, steam cylinder 8 x 12 compound; Steel Derrick sand plant, complete with 85-ft. steel boom; one 12 x 12 three-drum Lidgerwood cableway engine, 1100-ft. 2½-in. cable, carriage and equalizer; 50 h.p. Mine Hoist; one Buffalo Blower No. 8; one Buffalo Blower No. 10; one Sturtevant Blower No. 9; one 14 x 36 heavy-duty Monarch Corliss Engine; one 100-h.p. Thomas Electric Hoist, 220 D. C., 75-h.p., Upright Boiler.

Contractors Equipment Company
1010 Kansas Avenue **Kansas City, Kans.**

FOR SALE

2—No. 18 Gates K Gyratory Crushers with elevators and screen; complete; first class; immediate delivery. Also twenty other sizes.

J. F. DONAHOO CO.
Birmingham, Ala.

New—RAILS—Relaying

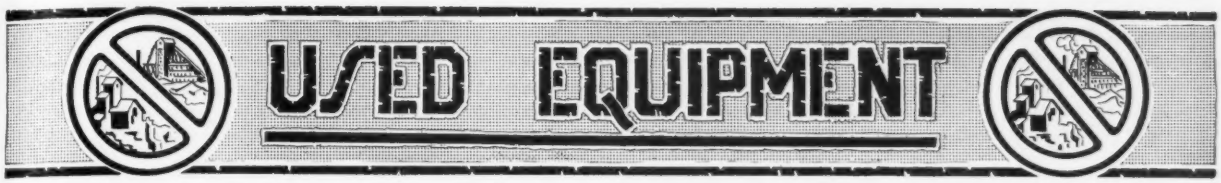
All sections on hand for quick shipment. Reasonable prices quoted. Our stock is very complete.

M. K. FRANK
Frick Building **Pittsburgh, Pa.**

FOR SALE

One second hand No. 5 Good Roads Crusher, with opening 11"x26", in excellent condition; a real bargain to a quick buyer. Address

Box 1453 **Care of Rock Products**



Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. please send check with your order. These ads must be paid in advance of insertion.

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25′, 3½ x25′, 4x30′, 5½x50′ 6x50′ and 7x60′; double shell dryers, 4x20′, 5x30′ and 6x35′; steam-heated air rotary dryers, 4x30′ and 6x30′.

KILNS—Rotary kilns, 3½x25′, 5x60′ and 6x70′, 6x100′, 7x80′ and 8x110′.

MILLS—6x8′, 6x5′, 2½x3″ 3x3½′ pebble and ball mills; 8x4′, 6x4′ and 4x4′ continuous ball mills; 3′ March mill; 42″, 33″ and 24″ Fuller-Lehigh mills; **4½x20′, 5x11′, 5x20′, 5½x22′ and** 6x20′ tube mills; 7½x13″, 9x15″, 16x10″ and 30x60″ jaw crushers; one "Infant" No. 00, No. 0, No. 2. No. 3, and No. 9 Williams' swing hammer mills; **one Kent type "G" mill; 36″ and** 40″ cage mills; 3′ and 4½′ Hardinge mills; 18x12″, 20x12″ and 30x10″ roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one **No. 2 Sturtevant ring roll crusher; 3 roll and** No. 000, No. 00 and No. 0 Raymond mills; one No. 5 Telsmith breaker; one 36″ Sturtevant emery mill; one 3 roll Griffin mill; 60″ chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; one keystone excavator; 6x8′, 6x5′ and 4x3′ Newaygo vibrating screens, Richardson automatic scales.

Air compressors and tanks.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

FOR SALE

2—13-ton Standard-gauge Whitcomb Gasoline Locomotives.

1—Class "G" Ingersoll-Rand Air Compressor, 925-ft.

1—Class "H" Ingersoll-Rand Air Compressor, 342-ft.

1—Aerial Tramway System, 1100-ft. centers, with 12 buckets and carriers, 2650 ft. ¾ in. pulling cable, with 1¾ in. and 1¼ in. carrying cable, with sheaves, counterweight equipment, 65 H. P. motor and speed reduction gears complete.

1—Model G Marion Shovel, 2 yd. dipper, standard railroad trucks, excellent condition; price right.

THE CASPARIS STONE CO.
Columbus, Ohio

FOR SALE

No. 1 Sturtevant Ring Roll Pulverizer.
9″x18″ Climax Jaw Crusher.
75 h.p. Erie City Steam Engine.
125 h.p. Atlas Steam Engine.
12″x12″ Lidgerwood Standard Cableway Engine.
44″ diam. by 26′ long Rotary Dryer.
600 lineal feet 1⅝″ Roebling wire rope.
100 h.p. 60 cycle, 550 volts, F&M Motor, never used.
100 K.W. 60 cycle, 550 volts, F&M Generator, never used.

Address E. W. Cooper, Engineer
2010 Locke Ave., Nashville, Tenn.

Idle Machinery Absorbs Profits

This department is the medium for the men who keep the wheels going. Sell your idle machinery to the man who'll keep it going.

AUSTIN GYRATORY CRUSHERS

2—No. 2, Standard Drive
1—No. 3, Standard Drive
1—No. 5, Standard Drive
1—No. 5, Angle Drive
1—No. 6, Standard Drive
1—No. 7½, Standard Drive

These are a few specials that we wish to move quickly. We also have Crushers of other makes and sizes, also Jaw Crushers, Elevators, Screens, Conveyors, Cranes, Locomotives, Cars, Rail, Hoists and other machinery such as you use. Write us fully, and if you have excess plant, also mention what it is.

Reading Engineering Co., Inc.
1227 Tribune Bldg. New York, N. Y.

EQUIPMENT

1—⅝-yd. Thew "O" Traction Shovel.
1—3-ton, 4-ft. 8½-in. gauge Plymouth Gasoline Locomotive.
1—7x10 cyl. 36-in. gauge Vulcan Saddle Tank.
2—9x14 cyl. 36-in. gauge Porter Saddle Tanks.
1—10x16 cyl. 36-in. gauge Davenport Saddle Tank.
4—2-yd. 36-in. gauge Easton "V" dump cars.
5—3-yd. 36-in. gauge Lakewood "V" dump cars.
15—4-yd. 36-in. gauge Western dump cars.
5—30-ft. steel underframe side dump ballast cars.
3—16-yd. Western air dump cars.

ZELNICKER IN ST. LOUIS
"Everything for the Quarry"

FOR SALE

68 ft. Red Canvas Stitched Belt, 26 in. by 8-ply. Never been used. It is in the exact wrapping as delivered from factory.

For service and durability in conveying sand and gravel or crushed stone there is no better belt made. Write or wire immediately.

URBANA GRAVEL CO.
URBANA, TEXAS

WANTED

No. 5 McCully Crusher, standard discharge, give full particulars.

The Connecticut Quarries Company
152 Temple St., New Haven, Conn.

Immediate Delivery
18—8 & 9 K Crushers, Reg. Drive

2—150-H.P., 125-lb. Marine type boilers.
2—150-H.P. 125-lb. H.R.T. boilers, buttstrap.
4—No. 6 Gates (Mang. Flt.) nickel steel shafts.
1—No. 7½ & 1—No. 8 Gates reg. drive.
No. 2 & No. 3 Gates reg. drive.
Air Compressors (steam-belt) 50 to 4000 ft.
40 Boilers, 60-150 H.P., 100-130-lb.
25—60 & 100 H.P. Ver. Boilers.
4—NEW No. 4 Gates, Mang. Flt., $1750 ea.
1—No. 16 Koehring Paver, ½-yd., self-propelling, steam.
2—180-ft. Quick Shift, 30-ft. bucket towers.
2—156 Kva. 240 V. 60 Cy. 3 Ph. Eng. Sets.
50 Kw. 125 V. Dir. Cur. Eng. Set, $800.

Send us your inquiries—Pumps, Steam and Electric Equipment, etc.

ROSS POWER EQUIP. CO.
INDIANAPOLIS, IND.

Locomotives for Rent or Sale

2—50-ton 18x24 in. six-wheel switchers.
1—40-ton 17x24 in. four-wheel switcher.
1—40-ton Vulcan four-driver saddle-tank.
2—18-ton and 14-ton 36-in. gauge Vulcans.
2—10-ton 7x12 in. 36-in. gauge Vulcans.
1—10-ton 36-in. gauge Shay geared.

Miscellaneous

1—Marion 35 steam shovel on traction wheels.
1—Marion 76 steam shovel, No. 3503.
1—Lidgerwood dragline, 60-ft. boom, 2-yd. bucket.
100—60,000-lb. capacity box cars, 40-ft. long.
40—60,000-lb. capacity flat cars, 36-ft. long.
13—6-yd. dump cars, 4-ft. 8½-in. gauge.
12—1¼-yd. "V" steel dump cars, 36-in. gauge.
1—Western standard gauge spreader.
2-in., 4-in., and 6-in. simple, duplex, and centrifugal pumps, 10 H.P. and 45 H.P. upright boilers, tripod drills, etc.
LOCOMOTIVE CRANES, RAILWAY EQUIPMENT, etc.

INDUSTRIAL EQUIPMENT CO.
McCormick Building, Chicago, Ill.

FOR SALE

100 H.P. Locomotive Fire Box Boiler, 125 lbs.

100 H.P. Vertical Boiler, 100 lbs.

1—No. 8 Good Roads Jaw Crusher on skids, with 40-ft. Jeffrey chain bucket elevator.

1—No. 9 Good Roads Jaw Crusher mounted on wheels, with 14-ft. bucket elevator.

1—36″ Symons Disk Crusher.

The Carmichael Gravel Company
Rialto Building, St. Louis, Mo.

FOR SALE

FULLER MILL, 42″ Standard, fan discharge, belt driven type. Practically new, immediate delivery. LOCOMOTIVE, 18 ton, 10x16 Porter 36″ gauge saddle tank in good operative condition. Address

Box 1450 Care of Rock Products

J. C. BUCKBEE COMPANY
ENGINEERS
BUILDERS OF CEMENT PLANTS
FIRST NATIONAL BANK BUILDING
CHICAGO, U. S. A.

The House of Dependable Service
HYMAN-MICHAELS COMPANY
Peoples Gas Building
CHICAGO
NEW AND RELAYING RAILS

BRANCH OFFICES
New York, N. Y. 1324 Woolworth Bldg.
Pittsburgh, Pa. 1313 1st National Bank Bldg.
St. Louis, Mo. 2115 Railway Exchange Bldg.

We Design and Equip Complete Plants
for the manufacture of gypsum products, such as wall plaster, moulding plaster, wall board products, gypsum block products, also mixing plants.

We are prepared to furnish complete machinery-equipment and design and furnish plans for the installation. Consult our Engineering Department. Forty years' experience in designing of wall plaster machinery and plants.

The J. B. Ehrsam & Sons Mfg. Co.
Engineers, Machinists and Founders
Enterprise, Kansas

Robert W. Hunt Jno. J. Cone Jas. C. Hallsted D. W. McNaugher
ROBERT W. HUNT & CO.
Inspection—Tests—Consultation

Inspection New and Second Hand Machinery, Pumps, Crushers, Steam Shovels, Cars, Locomotives, Rails and Quarry and Contractors' Equipment

INSPECTION AND TESTS OF SAND, GRAVEL, CEMENT, STRUCTURAL STEEL, CASTINGS AND CONSTRUCTION MATERIALS

Cement, Chemical and Physical Testing Laboratories
New York St. Louis CHICAGO Kansas City Cincinnati Pittsburgh San Francisco

James N. Hatch, C. E., M. E.
Member A. S. C. E.
CONSULTING ENGINEER
500 Old Colony Bldg., Chicago

Designs and Constructs
Complete Sand and Gravel Screening and Washing Plants.
Stone Crushing and Storage Plants. Conveying Systems. Contractors' Material Plants
Electric Generating Plants and Transmission Lines.
Estimates and Plans Furnished

TERRY FULL CIRCLE CRANES

FULL CIRCLE CRANES. "EQUIPMENT THAT LASTS." TIMBER & STEEL DERRICKS.
LET US SOLVE YOUR MATERIAL HANDLING PROBLEMS.

Steel and Timber DERRICKS TERRY

BACON-FARREL ORE & ROCK CRUSHING-WORLD KNOWN ROLLS-CRUSHERS
EARLE C. BACON, INC. ENGINEERS
26 CORTLANDT ST., NEW YORK

OHIO
LOCOMOTIVE CRANES
OHIO LOCOMOTIVE CRANE CO.
POPLAR ST. BUCYRUS, OHIO

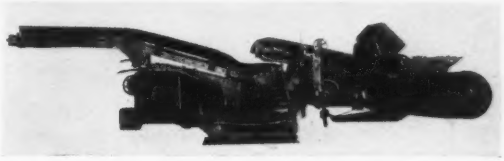
THEY'RE SELF-PROPELLED

MYERS WHALEY SHOVELS

There's no need of pushing or pulling a Myers-Whaley Shovel around. It is self-propelled, adaptable to any gauge track, and loads at the rate of one ton a minute.

Send for catalog

MYERS WHALEY CO., Knoxville, Tenn.



PERFORATED SCREENS
MADE TO SUIT YOUR REQUIREMENTS
Let Us Quote Prices
Service and Quality
NORTMANN-DUFFKE CO
1200 27th Avenue Milwaukee, Wis.
THE MARK OF QUALITY

SCREENS
of All Kinds
Chicago Perforating Co.
2445 West 24th Place
Tel. Canal 1459 CHICAGO, ILL.

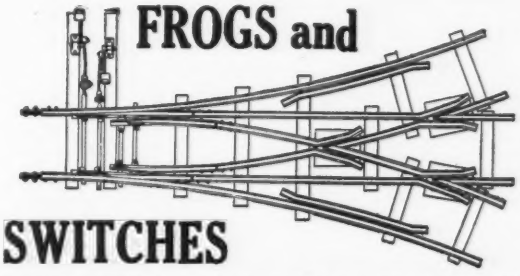
WHY? — WOOD DRILLS

Because They—
Drill faster
Stand more abuse
Need less repairs
Thrive on hard work

Men who know, prefer "WOOD DRILLS"
Because they fill the bill and cut the cost.

Wood Drill Works
30-36 Dale Ave. Paterson, N. J.

FROGS and SWITCHES



The Central Frog & Switch Co., Cincinnati, O.
Frogs, Switches, Crossings, Switch Stands, Rails, Angle Bars, Fishplates, Throws, Rail Braces, Tie Plates, Portable Track, Etc., Etc.

"Hercules Solid Weld"
Steam Shovel Chains

Best In the World. Will Actually Wear Out

The Columbus McKinnon Chain Company
Columbus, Ohio

The Baldwin
Locomotive Works
Philadelphia, Pa.

Steam and Gasoline
LOCOMOTIVES
for
Industrial Service

GEAR AND FRICTION DRIVEN GASOLINE LOCOMOTIVES—2½ TO 25 TONS ON DRIVE WHEEL

WHITCOMB LOCOMOTIVES

IT WILL PAY YOU TO GET OUR PROPOSITION BEFORE YOU BUY

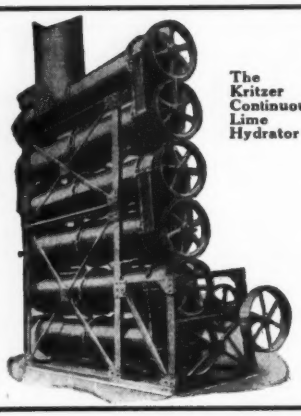
GEO. D. WHITCOMB CO.

MAIN OFFICE AND WORKS

ROCHELLE, ILLINOIS

U. S. A.

STORAGE BATTERY LOCOMOTIVES—1 TO 8 TONS ON DRIVE WHEELS



The Kritzer Continuous Lime Hydrator

Hydrating Lime

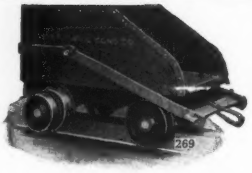
97% of Hydrated Lime is made either by the Old or by the New Kritzer Process. We Guarantee to manufacture the Best Product at the Lowest Possible Cost. Our engineers have worked out every practical improvement in use today in hydrating lime.

It is our business to solve your problems.
It is our business to investigate thoroughly the conditions that prevail at every plant, to work out all the details and to build a plant that will prove a success from the start.

We assume the Responsibility. Now is the time for you to act. Take the matter up with us NOW and we will outline your whole proposition for you.

THE KRITZER COMPANY
503 South Jefferson Street CHICAGO, ILL.

EASTON CARS



Skip cars for steep inclines, of various designs to meet special requirements. For twenty-five years we have been making all kinds of industrial cars satisfactorily.

Let us help you

EASTON CAR & CONS'T'N CO.

49 Dey Street, New York **Works: Easton, Pa.**
Boston Chicago Detroit Philadelphia Pittsburgh

SAUERMAN DRAGLINE CABLEWAY EXCAVATORS

dig, convey, elevate and dump in one operation

Cost data furnished by prominent gravel producers who are using Sauerman equipment backs up our claim that sand and gravel can be excavated and conveyed from pit to plant by one of our drag-line cableway excavators at a lower cost per ton than by using any other equipment or combination of equipment.

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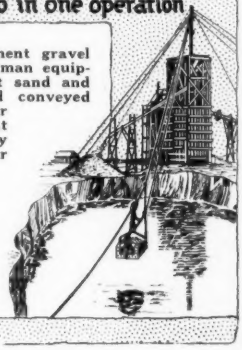
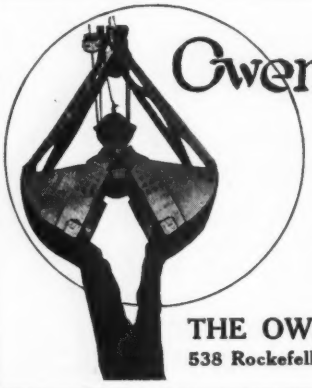
Also Mfrs. of Power Scrapers





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combine dollar-saving features of bucket construction which are illustrated in our latest catalogue.

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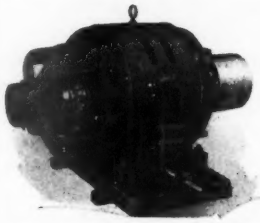

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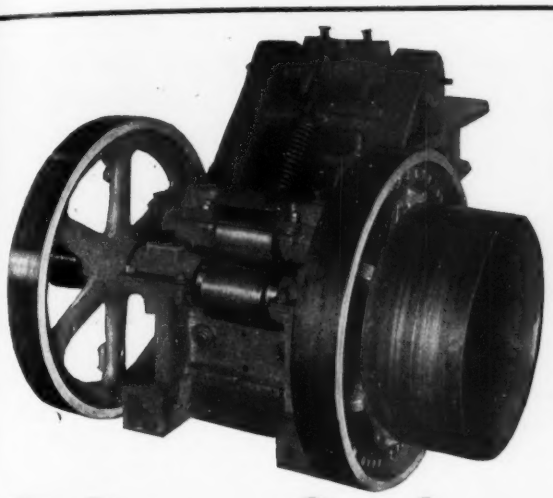

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IN ALL SIZES FOR EITHER PORTABLE PLANTS FOR ROAD BUILDING OR STATIONARY QUARRY INSTALLATIONS.

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MANUFACTURERS OF THE FAMOUS RELIANCE LINE OF ROAD BUILDING AND QUARRY EQUIPMENT

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"Very Economical"

"During the past year we have moved approximately 50,000 cu. yds. of slate shale with our ERIE Shovel. It is a wonderful machine, ideal for our work, as it is easily moved. We find it very economical and inexpensive. We are very much pleased with our investment." *N. M. Male, Sec'y, JACKSON-BANGOR SLATE CO., Pen Argyl, Pa.*

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The ERIE Shovel is easy to operate, and very speedy. It is built with extra strength all the way through, and gives steady service in hard rock loading. Let us send you full details about the ERIE Shovel, and what it will do. Write for a copy of Bulletin P.

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In the final analysis, you are satisfied only when results are satisfactory.

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Hettrick is "The Belt of No Regrets." It is dependable, reliable, always on the job. The standard for twenty-five years.

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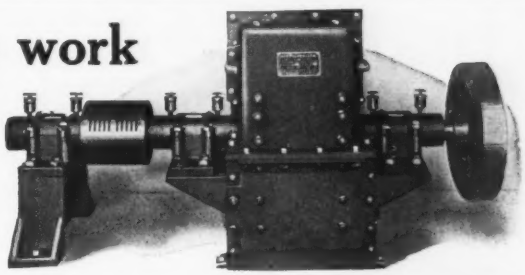
By the very nature of the work

it is called upon to perform a pulverizer must be much stronger than the material it handles.



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for tying reinforcement in concrete construction

Ties all kinds of reinforcement effectively —mesh, bars, metal lath, expanded metal. Also used in the manufacture of concrete pressure pipe and sewer pipe.

A handy tool which means efficiency and speed to the workman—a money saving device to the contractor.

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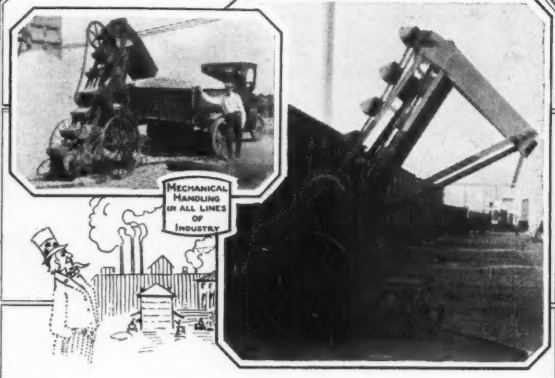

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Let us know your problem and we will submit a money saving plan at once.

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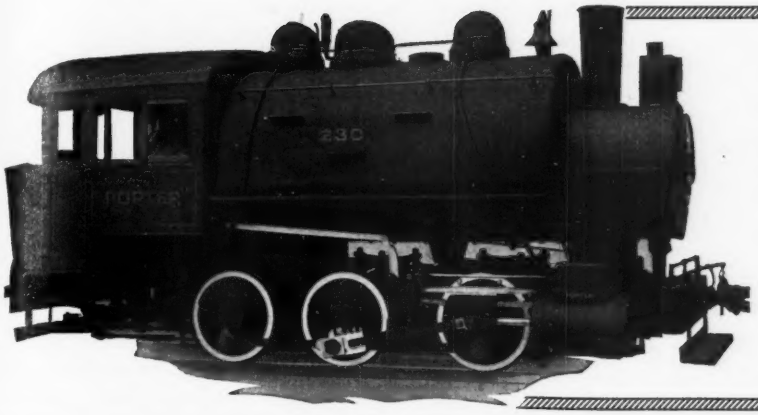

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The Clyde Hydrator produces big capacities of lime at only three-fifths the cost of any other hydrator on the market.

The Clyde not only produces over 90% of the hydrate of America, but makes the best quality of finishing lime from either high calcium or magnesium.

Simple, easiest to operate and most economical in cost of installing, maintaining, and operating.

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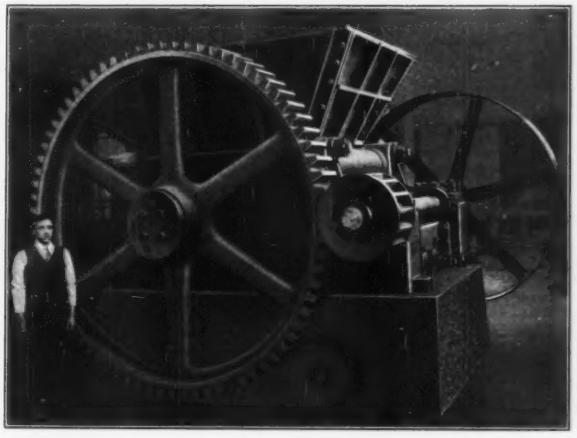

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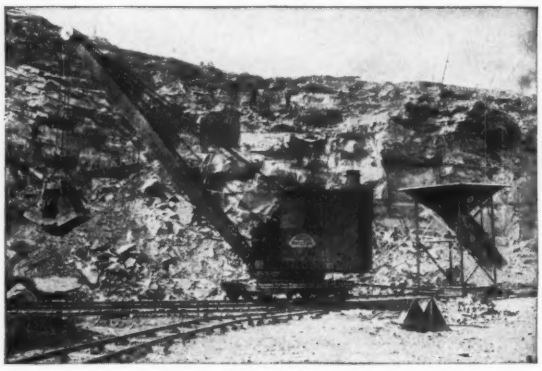

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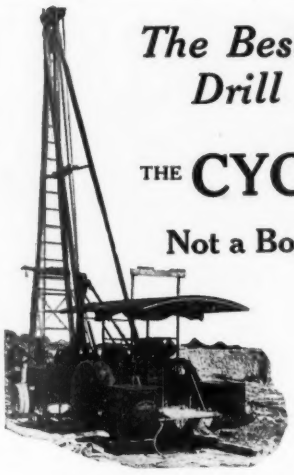

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If the Cyclone doesn't out-drill and out-wear all other drills, we will remove it from the work without cost to you.

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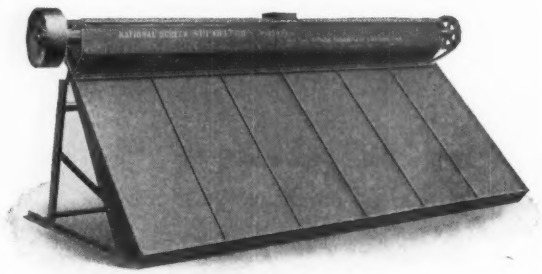

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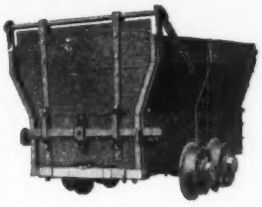

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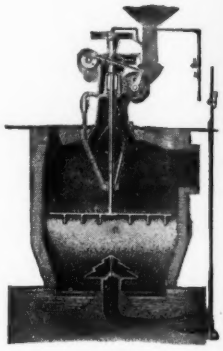

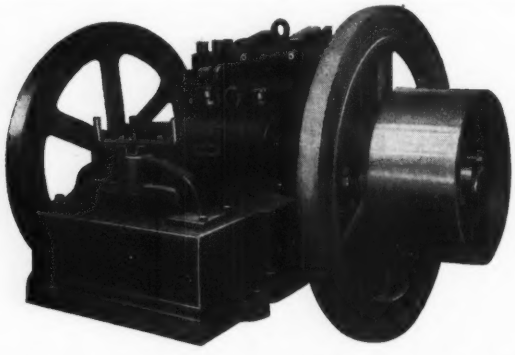

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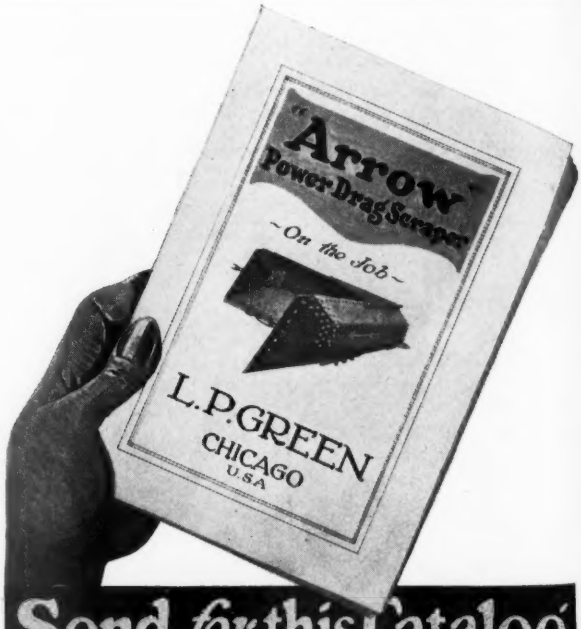

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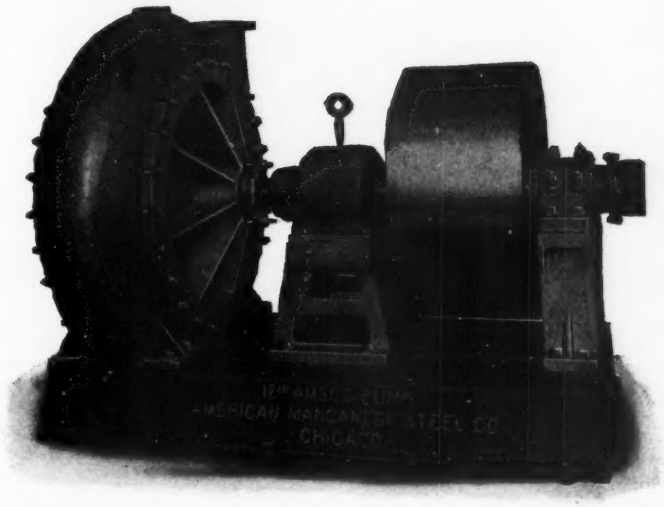

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It also digs the trench, places the main and back-fills with simple changes from dragline, clamshell or orange-peel to hook, skip, etc.

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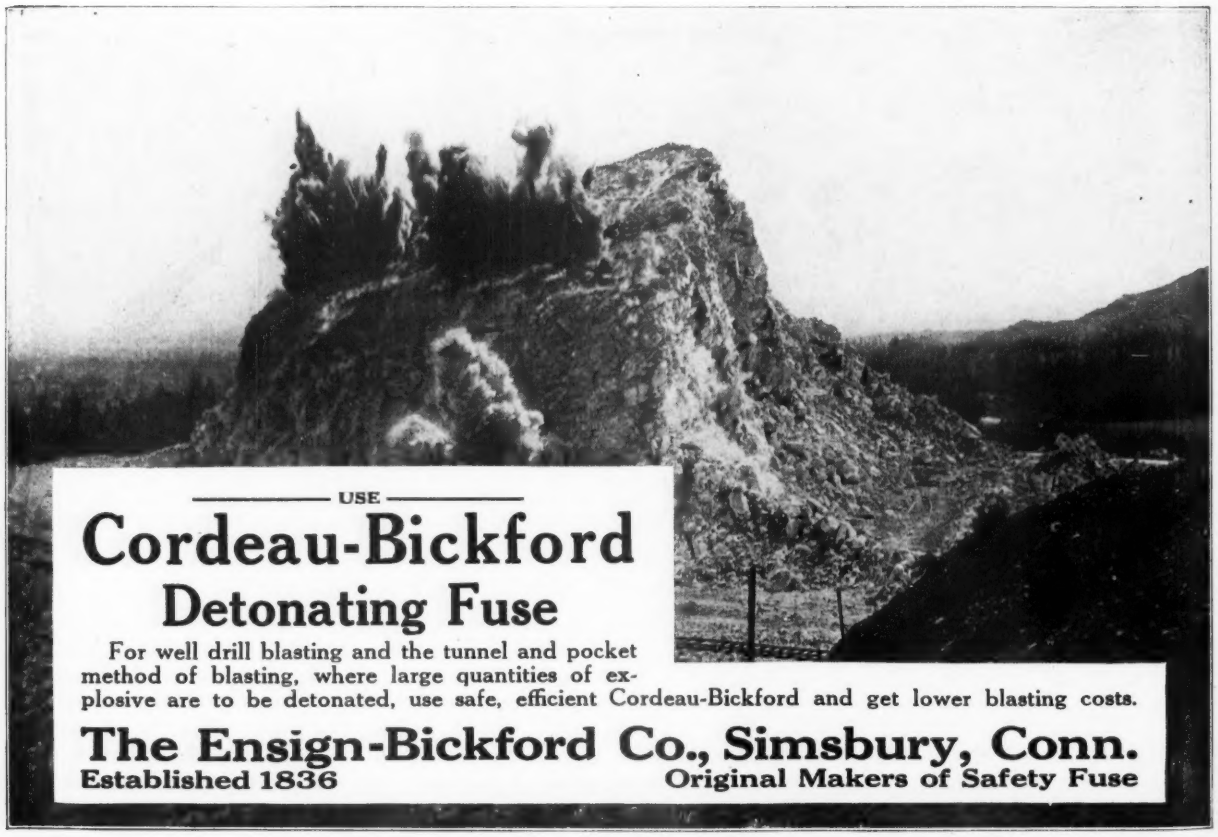
Sales Representatives in 25 Leading Cities



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For well drill blasting and the tunnel and pocket method of blasting, where large quantities of explosive are to be detonated, use safe, efficient Cordeau-Bickford and get lower blasting costs.

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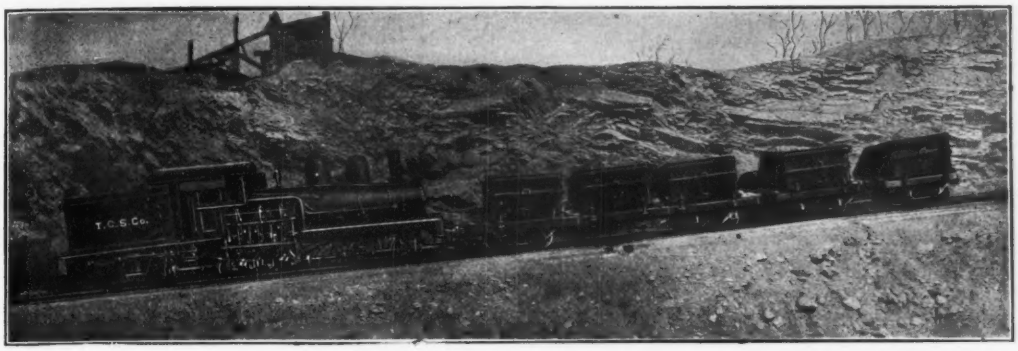
Established 1836 **Original Makers of Safety Fuse**



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Because of their flexible geared drive, "Shay" engines will get out rock from places inaccessible to rod engines.

All wheels of a "Shay" are drivers—including the tank wheels.

The "Shay" is the most flexible and powerful kind of motive power you can use.

The power is supplied by the three cylinders, producing a constant torque.

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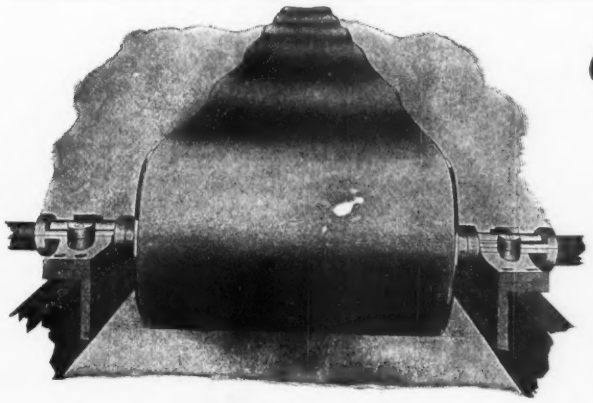

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Arno Conveyor Belts are manufactured to render unusually long and satisfactory service.

Made of a combination of duck, friction and extra cover stock, they are especially constructed for carrying ores, broken stone, sand, gravel, etc.

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Makers of Belting—Hose—Packings and Molded Specialties

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Continuous Discharge—Gas Fired

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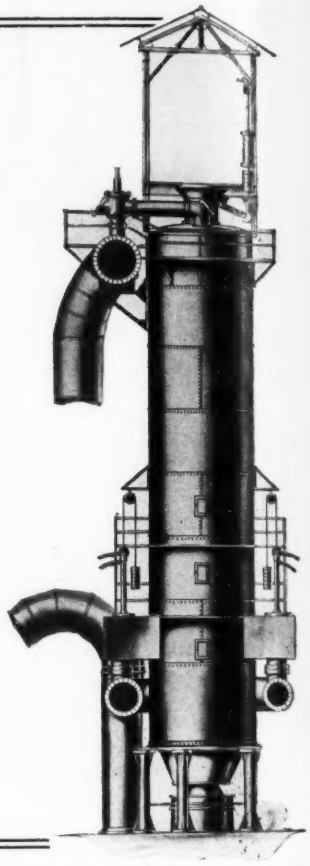
The wastefulness or efficiency of any lime burning apparatus is determined by the amount of fuel per ton of lime produced.

Our Kilns are not an experiment, but have successfully met the test of years of actual service. The design is the work of our Consulting Mechanical and Chemical Engineer, who has had many years of practical operative experience. They embody a number of labor saving devices, and are designed to secure maximum production with minimum fuel consumption; their record in this respect should interest every lime producer in the country.



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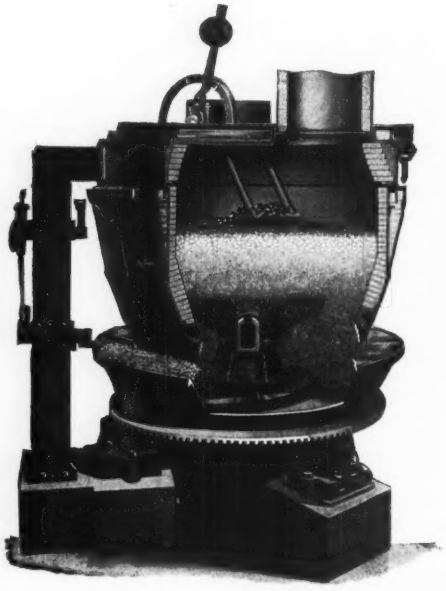

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POKERLESS PRODUCER-GAS MACHINE

Users everywhere testify with one voice to the superior satisfaction and **low maintenance expense** of this splendid machine. Difference in first cost comes back annually; every detail built for endurance.

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There are certain fundamental principles involved in S-A Gravel Plant design which insure superior results.

Our Engineers are glad to co-operate in the preparation of layouts for new projects and there is no charge for this service.

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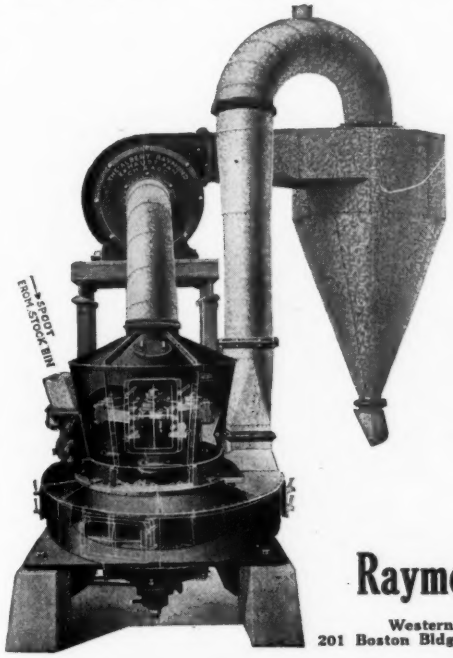
Another cement plant has decided to use Raymond Mills and grind their coal to a fineness of 90 to 92% passing a 200 mesh.



The use of finer coal for burning your cement is well worth your investigation.

Consider a saving of 10 to 15% of your coal at an additional grinding cost of only 25% and we think you can easily see the economy in the finer grinding.

With Raymond Mills you can count on a capacity from each mill of from three to four tons per hour, depending upon grade of coal used, grinding to a fineness of 90 to 92% passing a 200 mesh, which gives a product showing 98 to 99% passing a 100 mesh.

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